ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXI. No. 3392. NOVEMBER 27, 1942 Bi-WEEKLY

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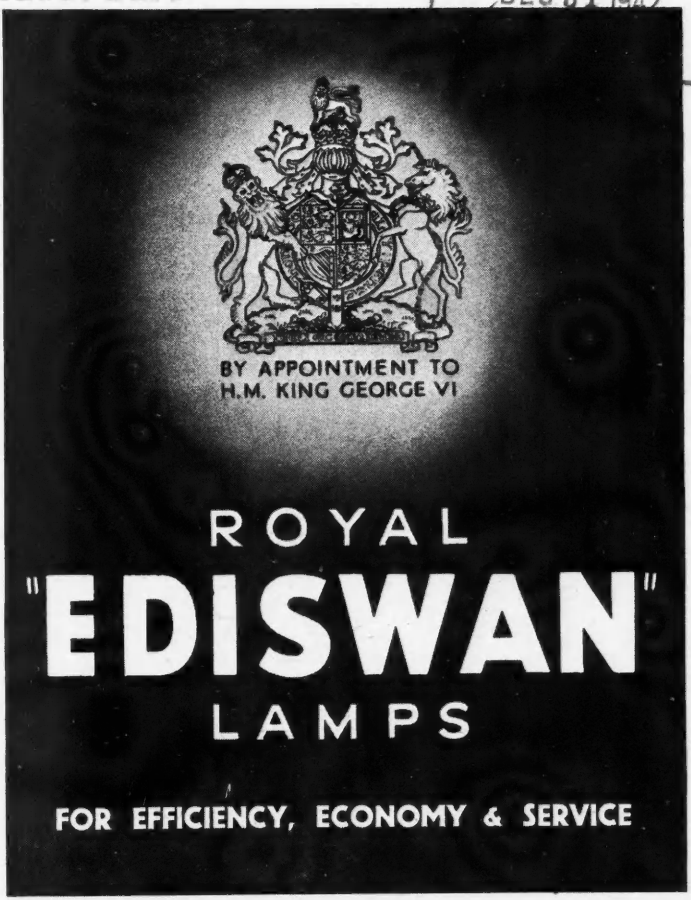
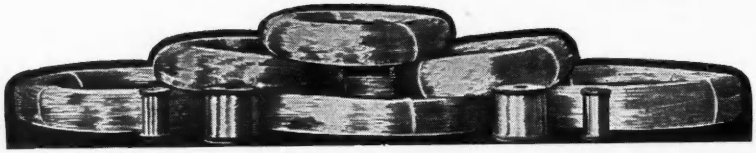


Advertisement of
THE EDISON SWAN ELECTRIC CO. LTD., 155 Charing Cross Road, London, W.C.2. (L.27)

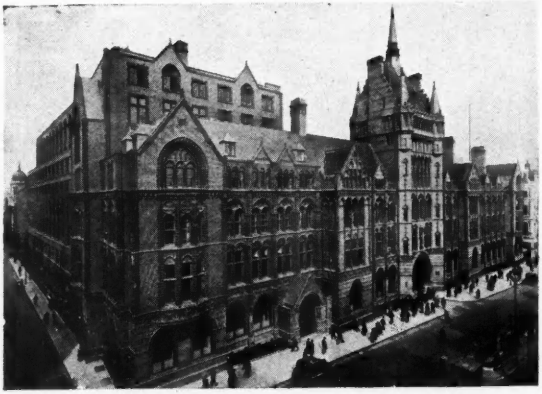


H.C. Soft Plain Tinned and Hard Drawn Copper Wire and Strip for all purposes

BRASS WIRE and STRIP

R. H. SYMONDS LTD.
39 VICTORIA ST., WESTMINSTER, S.W.1
Telephone No. : ABBEY 2771-5

FUEL ECONOMY *IN THE* BOILER HOUSE



The illustration shows the Chief Office of the Prudential Assurance Company, Ltd.—to whom we are indebted for permission to reproduce this photograph—where is installed Electrical CO_2 Equipment for combustion control in the Boiler House.

ELLIOTT BROTHERS (LONDON) LIMITED
CENTURY WORKS, LEWISHAM, S.E.13

. . . AN URGENT WAR-TIME NECESSITY

We supply instruments and control panels for Boiler Plants and Industrial Heating Installations, including the following:

CO_2 Measuring Equipment (Flue Gas Analysis)—for efficient combustion control and consequent fuel economy.

Flowmeters—for economy in steam consumption.

Temperature Indicators and Recorders—for steam, water and flue gas temperatures and other vital information.

Watch the Heat Losses . . . . and save fuel!

MICA
Processed Parts Precision Gauged for CONDENSERS, ETC.

DACIER LTD
22, Bargates, Christchurch, Hants.
Telep: Christchurch, 1011.
Electrical Insulation Specialists

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Sheet and Machined Parts of all kinds.

HEATRAE

AN ESCUTCHEON HELD HIGH FOR
SINCERITY

In the unseen interiors of Heatrae models will be found full evidence of sincerity.

Painstaking care carried to unobvious recesses, with obvious successes.

Leaders in Electric Heating

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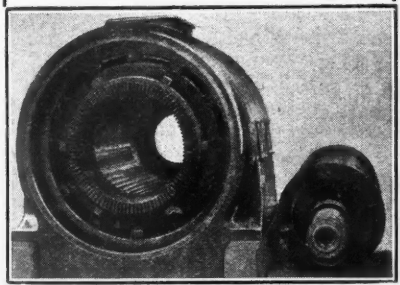
The WESTMINSTER ENG. Co. Ltd.

Victoria Road, Willesden Junction, N.W.10



1500 kVA Turbo Generator Stator and Rotor Entirely Rewound

Makers of Electric Welding Machines, Photo Printing and Process Arc Lamps. "Partridge" Pressure Detectors

Telephone: Willesden 1700-1

Telegrams: "Regency, Phone, London."

A

SOUND TERMINAL WITHOUT SOLDER

Suitable for Telephone Lines

FOR CABLES AND WIRES OF ALL KINDS

SIZES FROM ¼" to ½" HOLE

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ASHBROOK ROAD, LONDON, N.19

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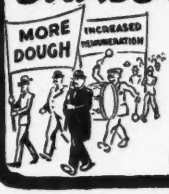

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MICA
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MICANITE
INSULATION

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MICANITE: In Moulding, Flexible and Commutator Qualities.
HEATER MICANITE for Domestic and other Electrical Appliances.
MICA: Uncut or cut to size and calibrated.
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A. C. MOTORS

FOR DAMP OR DUSTY SITUATIONS

35 B.H.P. 3-phase 50 cycle 400 volt 1470 r.p.m. 'N' Closed Fan-Cooled A.C. Slip-ring Motor driving a Spinning Frame

In those situations where dust, dirt, dripping water, or condensation from steam pipes are met with—where motor windings are liable to become clogged or saturated with moisture—there Peebles 'N' Closed Fan-Cooled Motors will give trouble-free service and lower operating costs.

THOROUGHLY PROTECTED
READILY ACCESSIBLE

BRUCE PEEBLES & CO. LTD.
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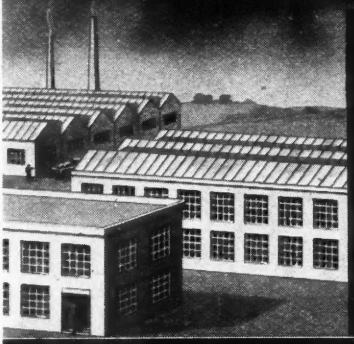
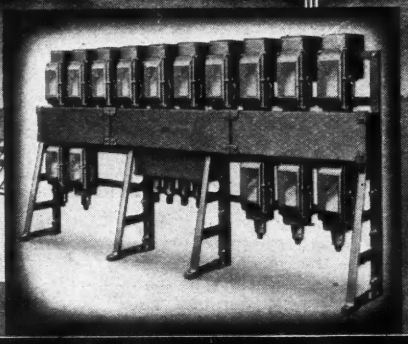
Manufacturers of all sizes and types of Rotating Electrical Machinery, Transformers and Rectifiers

3563

MAIN CONTROL GEAR
for all factories

BILL





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"BILSWITCH" BIRMINGHAM

Simple-Speedy-Reliable-
the safe Insulation Stripper

MADE IN ENGLAND

Severs the insulation cleanly without damaging the conductor, by means of an electrically heated resistance wire. Recommended for the various types of wires used in the Radio Electrical Instrument and allied trades. Suitable for supply Voltages 220-250 A.C. Consumption 30 watts. *Please write for further details.*

SOLON
ELECTRIC
INSULATION STRIPPER

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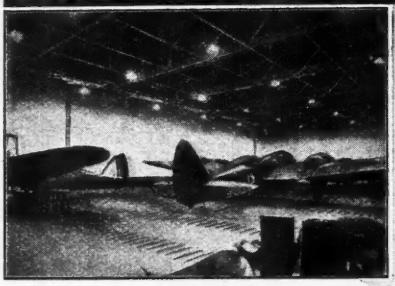
Sales/Engineering Dept., MILTON COURT, WESTCOTT, DORKING, SURREY

A*

BRIGHTER OUTLOOK *for* OUTPUT



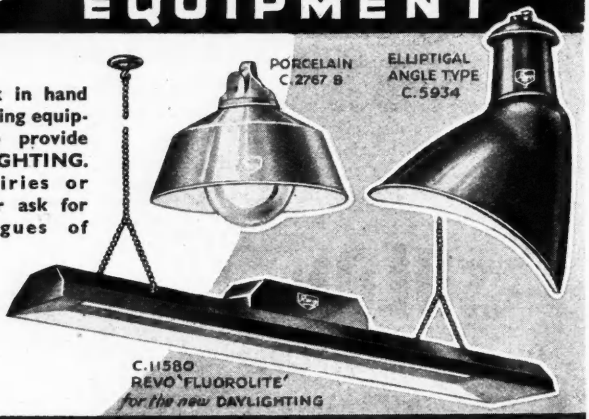
Adequate labour—ample supplies—and all the machinery in the world are not sufficient in themselves for greater output. Your workers must be able to SEE.

Light up CORRECTLY—

With **Revo**

INDUSTRIAL LIGHTING EQUIPMENT

Whatever the work in hand there is REVO Lighting equipment available to provide THE IDEAL LIGHTING. Send your enquiries or problems to us or ask for complete catalogues of equipment.



REVO ELECTRIC CO. LTD., TIPTON, STAFFS

B T-H

FRACTIONAL HORSEPOWER MOTORS

The most popular in the country

Spigoted or Plain Endshields for direct mounting on the machine

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BTH products include all kinds of electric plant and equipment ; and Mazda, Mercra, and Sodra lamps

Vertical, Horizontal, or Inclined Mounting

Sizes from ¼ H.P. to 1 H.P.
Three-phase up to 550 volts
Single-phase up to 250 volts
D.C. up to 520 volts

BTH

THE BRITISH THOMSON-HOUSTON CO., LTD.
CROWN HOUSE, ALDWYCH, LONDON, W.C.2.

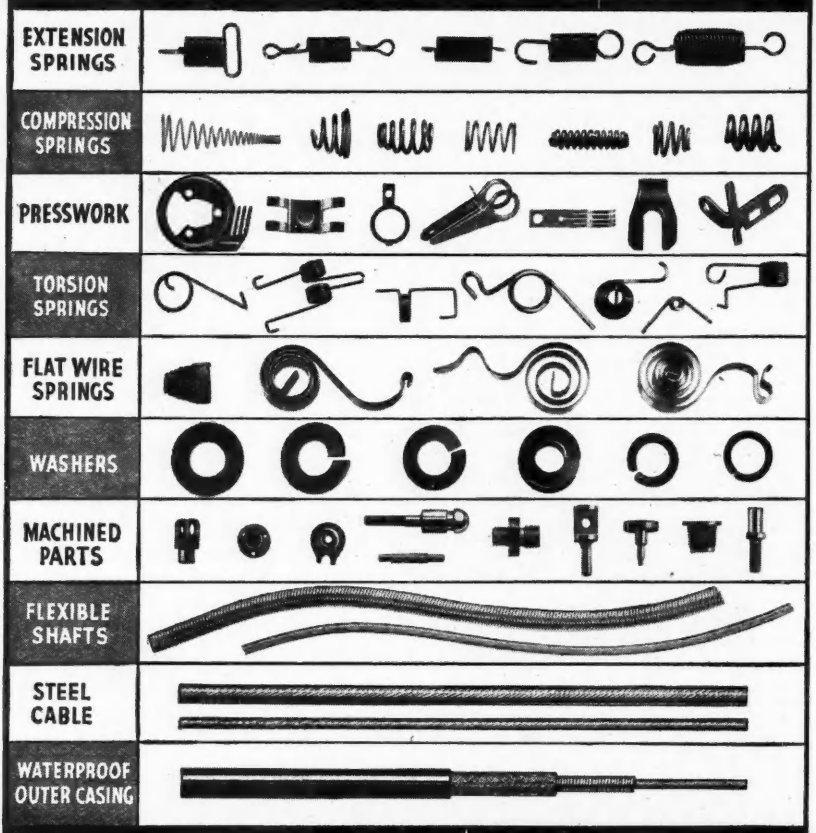
A3144

UNDER ONE ROOF..

Daily there flows a never-ending stream of immensely varied precision products from underneath the roof tree of "TERRYS OF REDDITCH." Below is shown a tiny cross-section . . . to list and illustrate them all would be a difficult task.

From a featherweight tiny watch spring to a powerful brake cable . . from a gramophone needle to a pressed steel spanner, Terry's make them all, in all shapes and sizes. They can help you with your spring or presswork problem.

Write for a copy of their wartime catalogue)



TERRY'S of REDDITCH

★ MOTOR & MOTOR CYCLE TOOLS · ACCESSORIES ALSO DOMESTIC ACCESSORIES

ESTABLISHED · 1855

HERBERT TERRY & SONS LTD., REDDITCH • *Also at London, Birmingham and Manchester*

Give longer life to your trailers

U.K. Patent No. 416812

The Henley Electric Vulcaniser provides a practical, speedy and reliable means of carrying out repairs and should be employed by all users of trailing cables. Full details on request.

Note these features of this up-to-date wax bath Electric Vulcaniser :—

1. *No alterations or spare parts are needed, and the vulcaniser is ready for use with cables of widely different diameters up to 2½".*
2. *More than one cable can be vulcanised at the same time.*
3. *The bath is free from obstructions inside, and is easy to clean.*
4. *Contact between the cables and the heaters is impossible.*
5. *The heaters are readily accessible.*
6. *The vulcaniser is readily portable. Approximate weight is only 44 lbs. Approximate overall dimensions 40" long, 9" wide, 6" deep.*

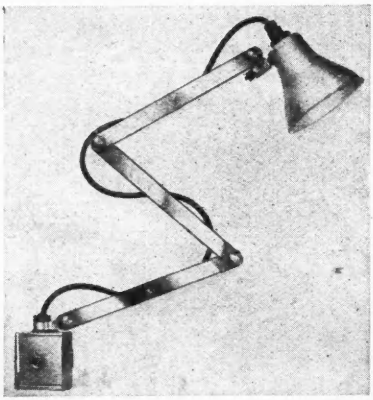
HENLEY Electric Vulcaniser

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.

MILTON COURT · WESTCOTT · DORKING · SURREY

PHONE: DORKING 3241 (10 LINES)
TELEGRAMS: HENLETEL, DORKING

MAXIMUM OUTPUT
DEPENDS ON
EFFICIENT LIGHTING



D & G GIRDER FITTINGS
FOR MACHINE TOOL AND BENCH LIGHTING

- Universal movement
- Concentration of light on the job
- Protects operators' eyes from glare
- Lower consumption
- Less lamp breakages

Made in Single-, Two- and Three-arm Extensions

Adopted by many of the Armament and other War Production firms

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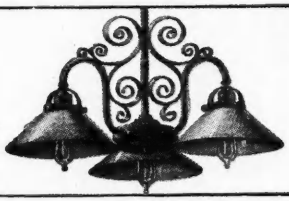
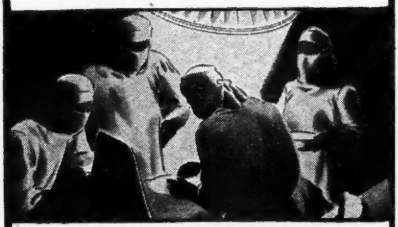
Midland Representative :
W. T. BOWER, 184 Jockey Road, Sutton Coldfield

In 1882 when electric light was a new invention—we pioneered the battery.



Today our batteries protect the lighting of important buildings



In 1882—four years after filament lamps were first introduced—our batteries lit the Royal Mint and other important buildings Today they are predominant for emergency lighting and are widely installed in hospitals, schools, hotels and institutions.

CONTRACTORS specify P. & G. & E.P.S. Cells with confidence because of their long record for reliability in Central Stations, Telephone Exchanges—and every other type of installation

EMERGENCY LIGHTING EQUIPMENT

(Licensed under Patent No. 313248). Emergency Lighting Equipment suitable for all types and sizes of installations can be supplied. Details on request.

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Our replating jobs are renowned for their long and reliable service

PRITCHETT & GOLD and E.P.S. Co. Ltd

Formerly The Electrical Power Storage Co. Ltd —The first battery makers—

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Telephone Sloane 7164
Telegrams: Storage, Sowest, London

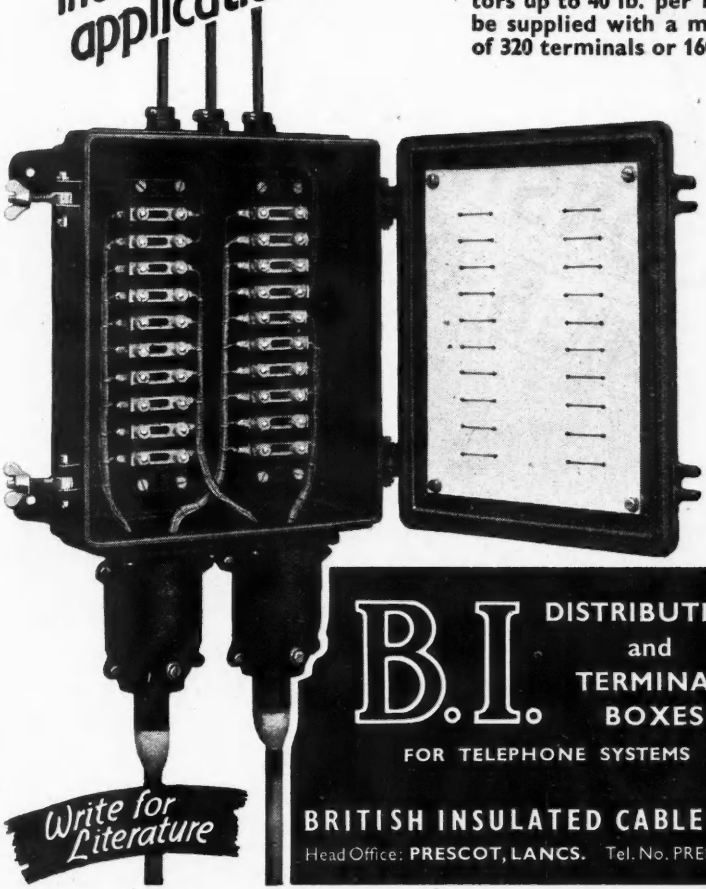
P.G.26

These boxes are being used extensively for telephone systems in industrial and allied applications

For sub-dividing main and branch cables at suitable points; designed to give a flexible scheme which can be readily re-arranged to meet subsequent changes in layout.

Terminals or captive sliding links are available. Chart boards are fitted to the inside of the lids, for recording the connections made.

A range of boxes for conductors up to 40 lb. per mile can be supplied with a maximum of 320 terminals or 160 links.



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FOR TELEPHONE SYSTEMS

Write for Literature

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E.L.M.A. LAMPS
MADE IN ENGLAND

for CONSISTENT HIGH QUALITY

The high quality of Elasta Lamps is due to the care taken in their construction. The tests made at every stage of manufacture ensure that this high standard is uniformly consistent, resulting in Elasta Lamps giving

CORRECT LIGHT ALL THE TIME

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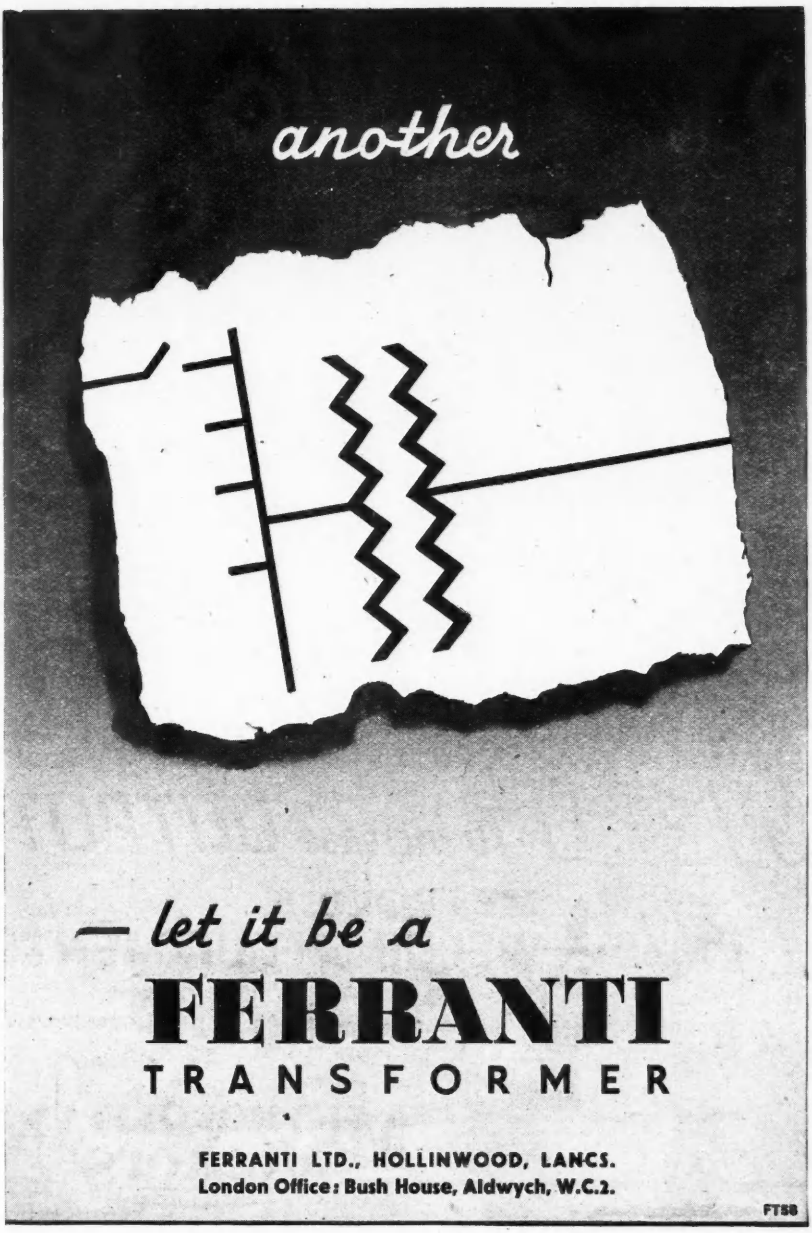
Grams: "Pope's, Bristol 23239."

BELFAST (Managers: Campbell, Gardner & Co.): 27 Franklin Street.
Tel.: Belfast 25171 *Grams: "Camergard, Belfast."*


another
— let it be a
FERRANTI
TRANSFORMER
FERRANTI LTD., HOLLINWOOD, LANCS.
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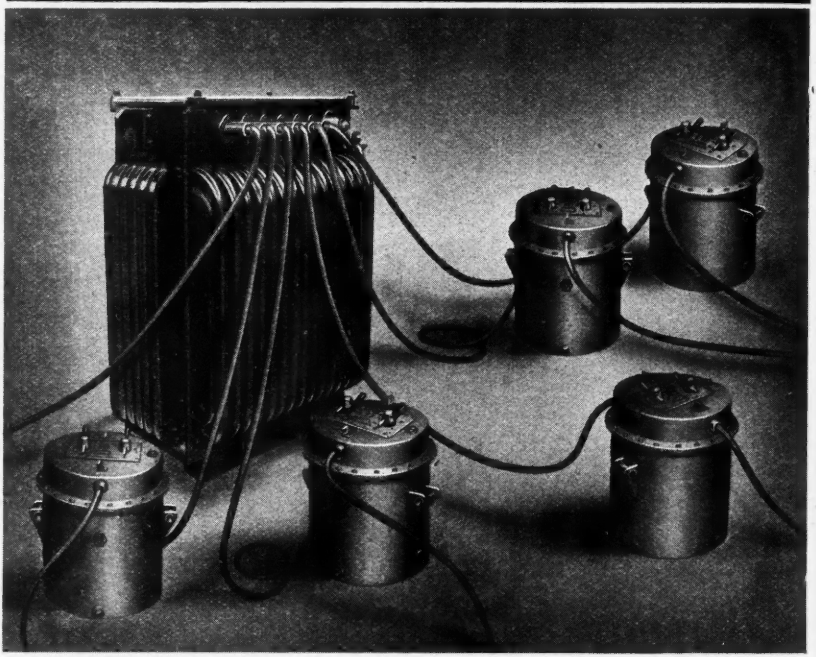
FTS8

MAN-HOURS X WELDING = INCREASED PRODUCTION



WELD To increase OUTPUT

With METROVICK WELDING EQUIPMENTS

These equipments will help you to increase your rate of production. They are designed for 3, 6, 9 or 12 operators at 300 amps. or for 3 or 6 operators at 600 amps. each.

Send for further particulars on this subject

The illustration shows the multi-operator A.C. equipment for six operators.

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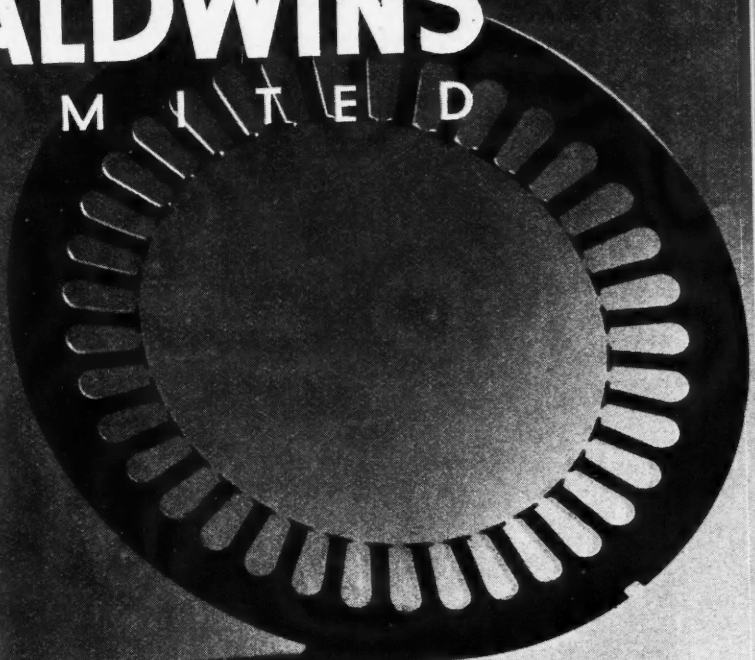
BALDWINS
LIMITED



TRANSFORMER SHEETS

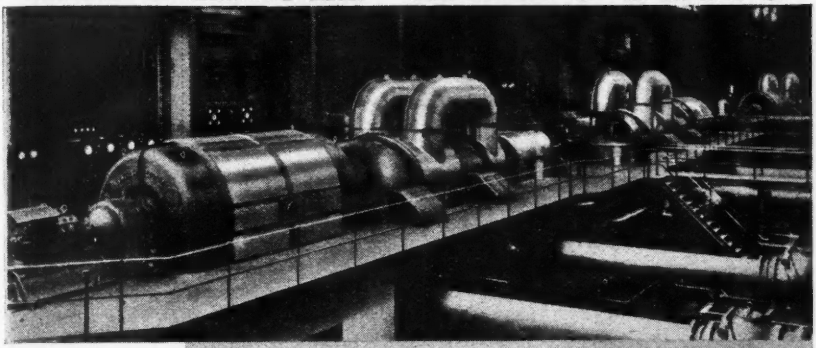
ELECTRICAL SHEETS

ELECTRICAL STAMPINGS

SURVIVAL OF THE FITTEST
...and the SURVIVAL OF THE FITTINGS!
R·E·A·L
INDUSTRIAL LIGHTING EQUIPMENT
If you are engaged on work of National importance we can probably supply you with industrial lighting equipment—R.E.A.L. equipment that is built to last! The illustration above is of our heavy-duty Railway pattern Dispersive Reflector, available in sizes from 10" to 20" diameter, for 40 to 1,500 Tungsten Filament Lamps.
Let us know your requirements.
require, insted
we are so busy supplying
R · E · A · L

Issued by Rowlands Electrical Accessories Ltd., R.E.A.L. Works, BIRMINGHAM 18.

'ENGLISH ELECTRIC'



Above: 25,000 kW. and two 30,000 kW. 3,000 r.p.m. three-cylinder Turbo-alternator sets in a British Power station.

TURBO-ALTERNATORS

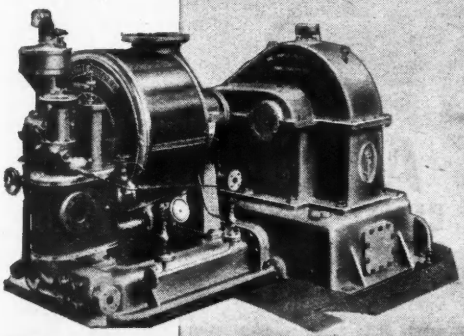
OF ANY TYPE AND SIZE

from a few hundred kilowatts up to large 3,000 r.p.m. multi-cylinder units for central power stations.

Quick-starting characteristics and flexibility under all load conditions ensured by high speed units with small rotating masses.

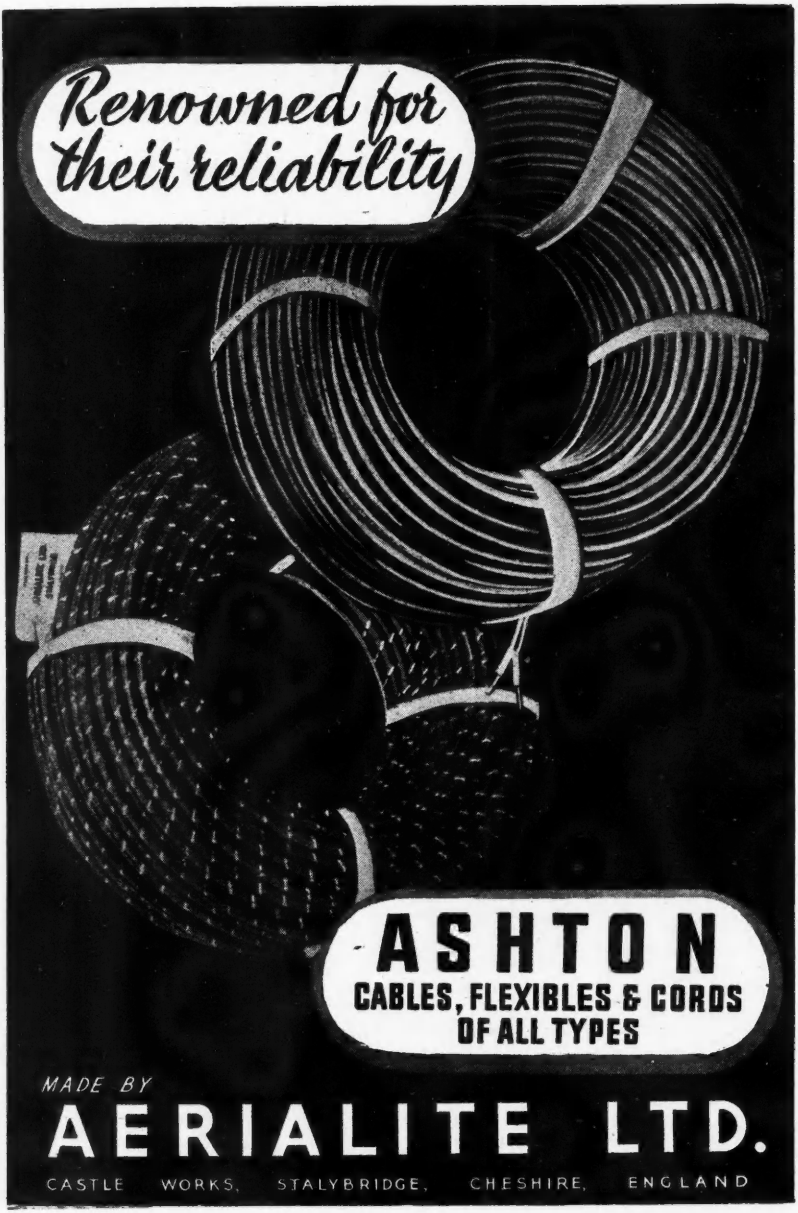
Your enquiries invited.

Below: 400 kW 6,000 r.p.m. Back-pressure Geared Turbine for Ship auxiliaries.



THE ENGLISH ELECTRIC COMPANY LIMITED

STAFFORD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ASHTON
CABLES, FLEXIBLES & CORDS OF ALL TYPES
MADE BY
AERIALITE LTD.
CASTLE WORKS, STALYBRIDGE, CHESHIRE, ENGLAND

PREPARATION OF METALLURGICAL SPECIMENS FOR THE MICROSCOPE

Purity and correct grade of materials are of paramount importance in the manufacture of WESTINGHOUSE METAL RECTIFIERS. One of the preliminary processes is the examination of crystal formations by means of the microscope, for which the specimen is first ground and then polished to provide an optically flat surface

PREPARATION

With nearly all our output earmarked, we regret that Westinghouse Rectifiers are so difficult to obtain. But behind the ever-increasing demands, technicians work ceaselessly after new developments. After the war there will be available to industry Westinghouse Rectifiers of remarkably advanced design—born of the persistent research now going on.

Westinghouse Rectifiers

WESTINGHOUSE BRAKE & SIGNAL CO. LTD., Pew Hill House, Chippenham, Wilts.

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WALSALL CONDUITS LTD.

"THEY ALSO SERVE WHO ONLY STAND AND WAIT"

In the National effort towards Victory, Steel Conduit is playing an important part in safeguarding Electric Supplies vital to the War Effort. In that essential work the Association of Steel Conduit Manufacturers gladly associates itself.

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Switchgear
Only a few representative types can be illustrated here, but almost every switchgear requirement can be met from our extensive range.
Long experience in design and manufacture, combined with technical research and testing, results in absolute dependability and assures complete satisfaction in operation.
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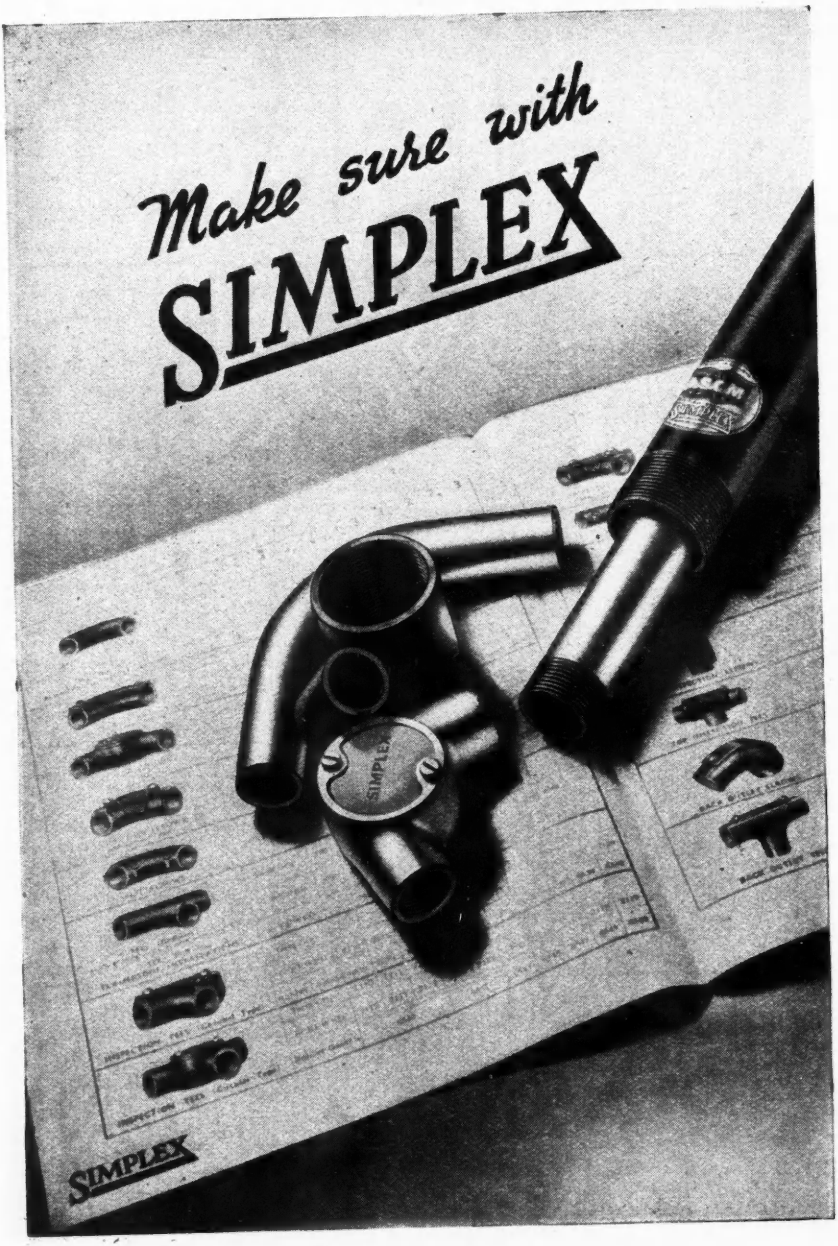
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NORMAL RATING: UP TO 3,000 AMPERES
UP TO 660 VOLTS

BREAKING-CAPACITY:
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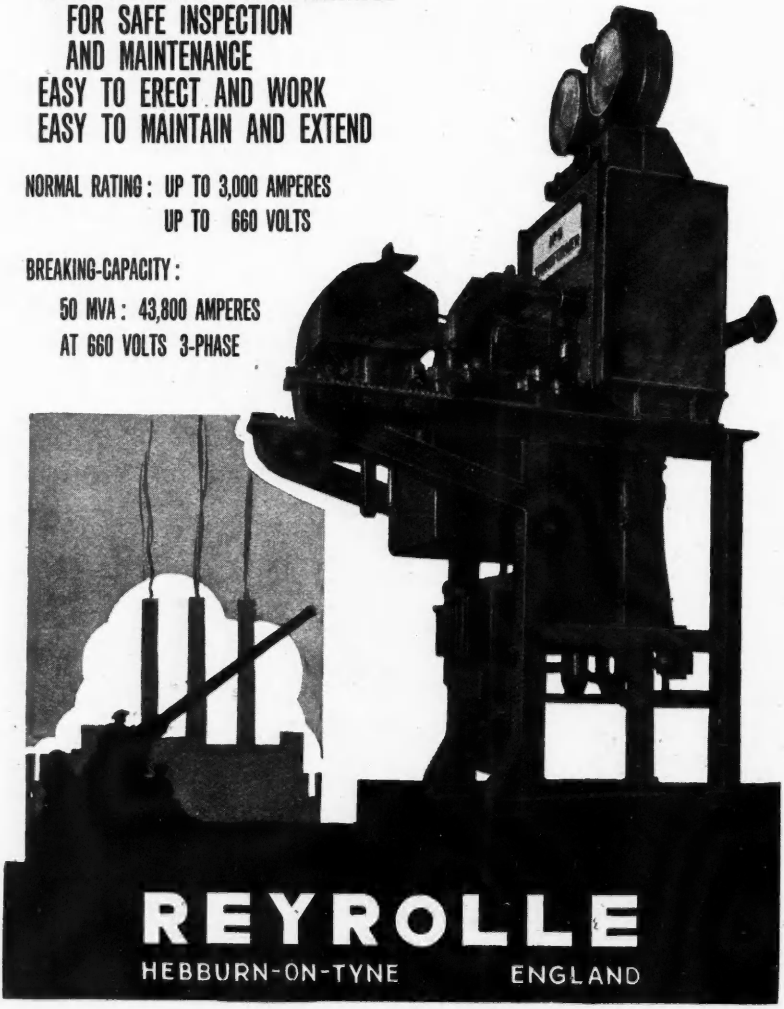

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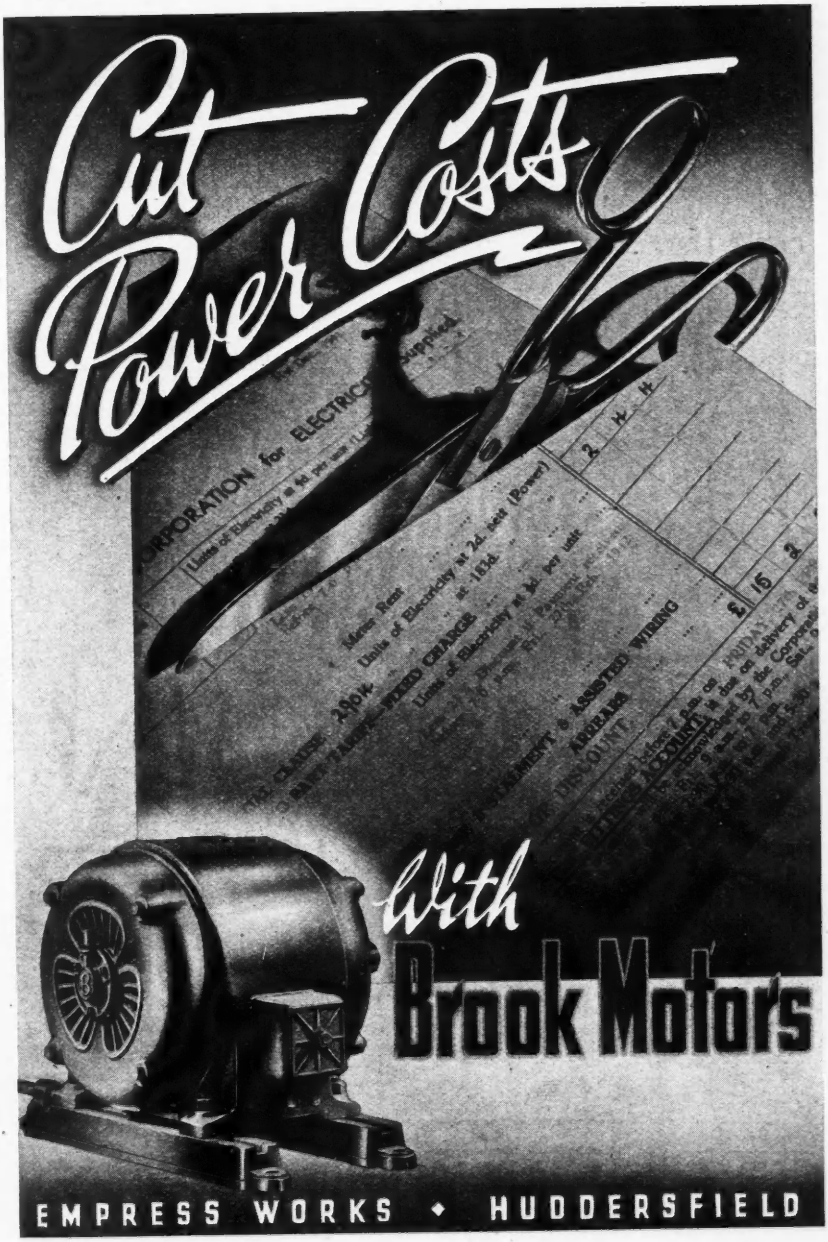
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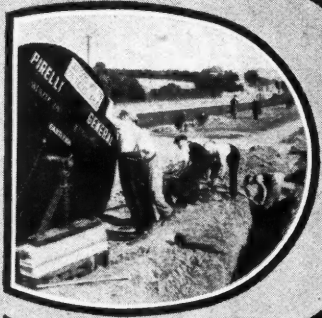

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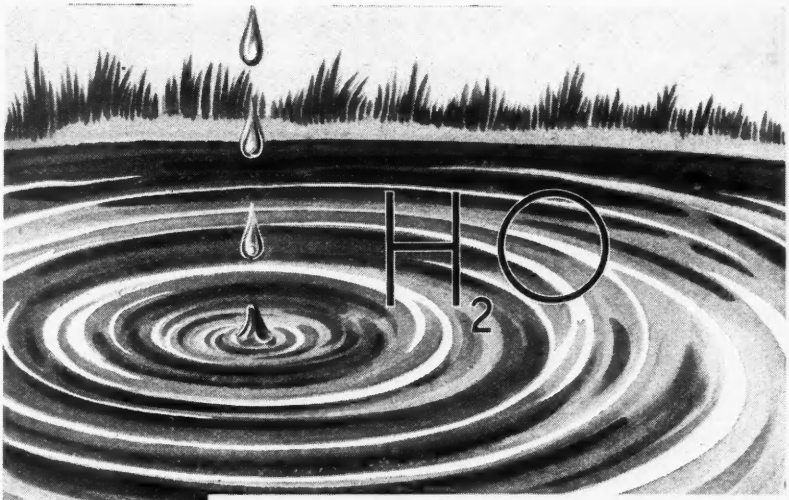

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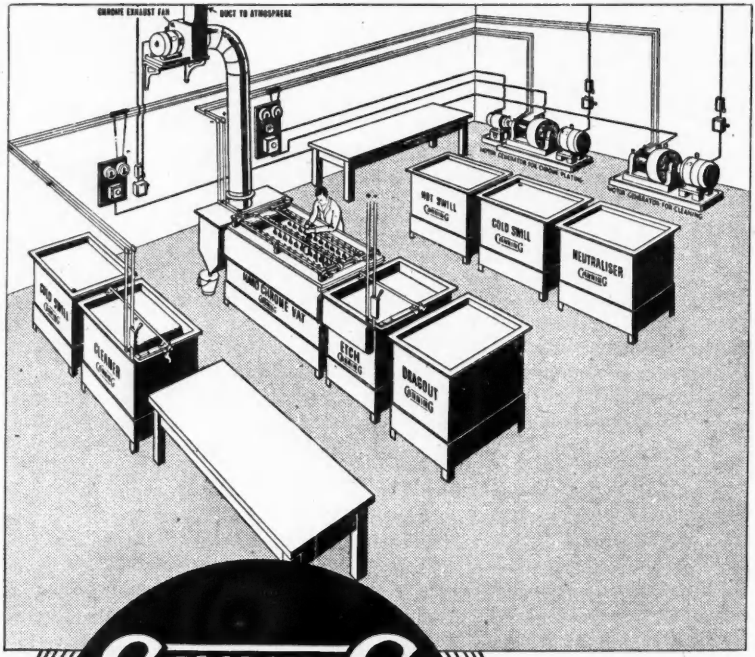

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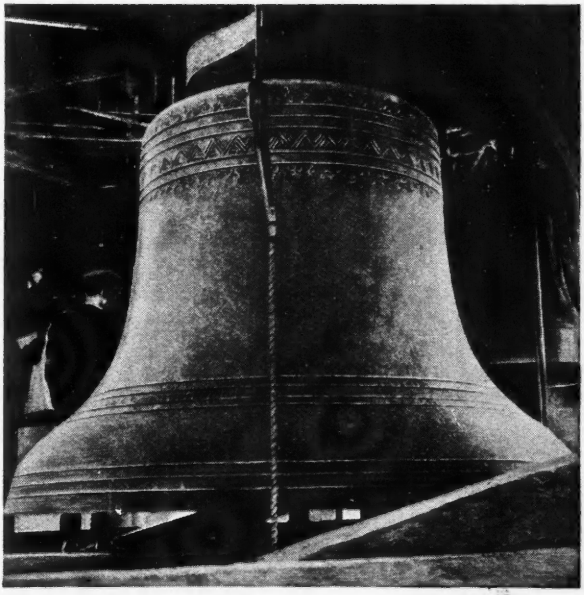

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Sir Edmund Beckett (afterwards Lord Grimthorpe) was both Architect and Lawyer; applied Astronomy and Horology were among his many craftsmanlike accomplishments. In 1851 he designed the great bell whose tongue now speaks majestically to the whole world.

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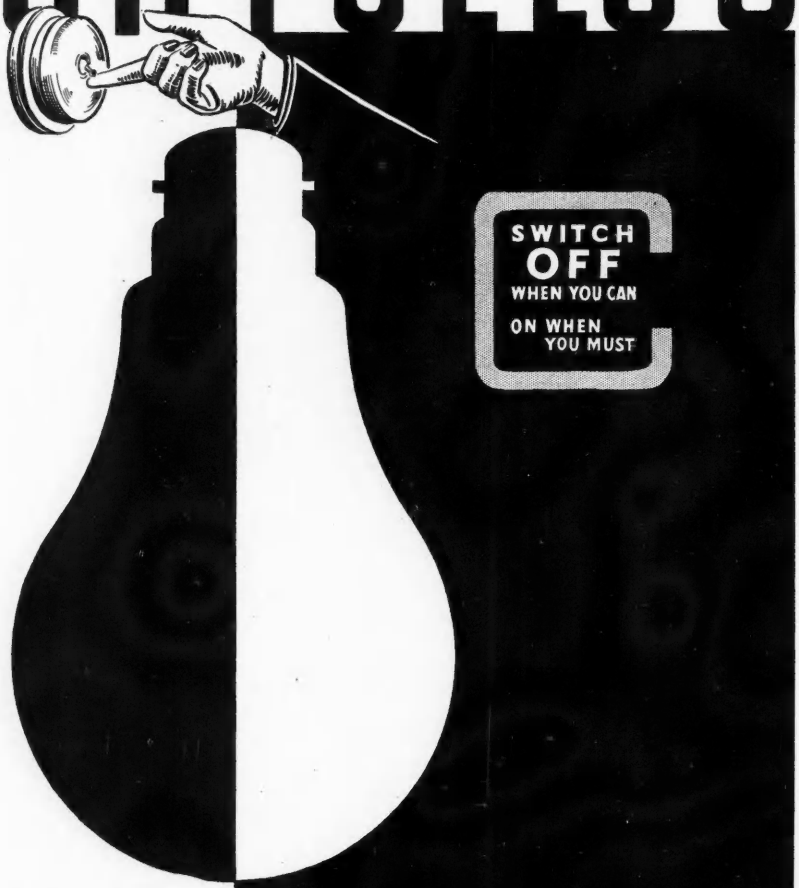

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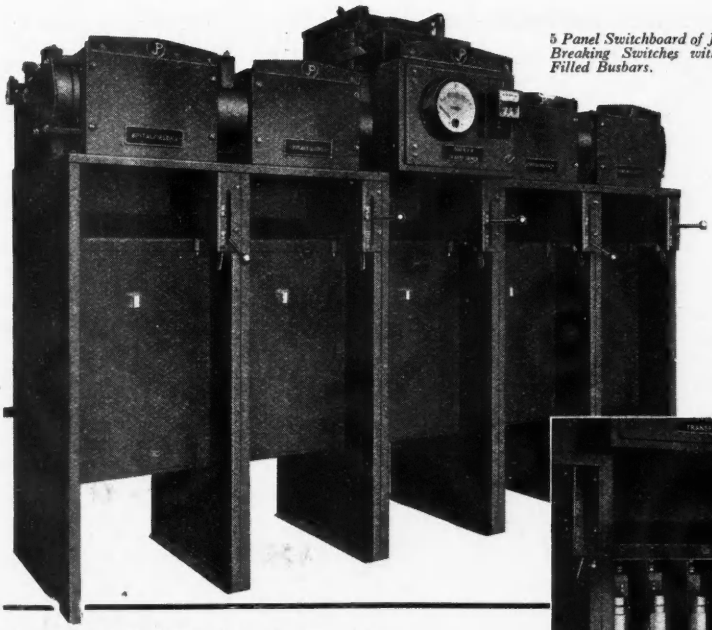

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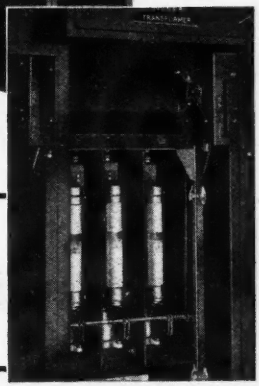
Close-up of "EETEE" Fuses with striker pin tripping device tripping all phases.



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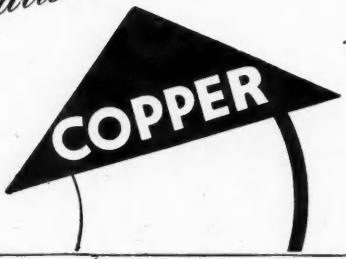

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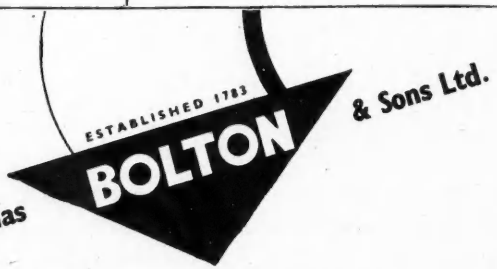

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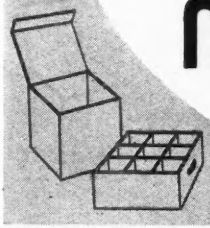

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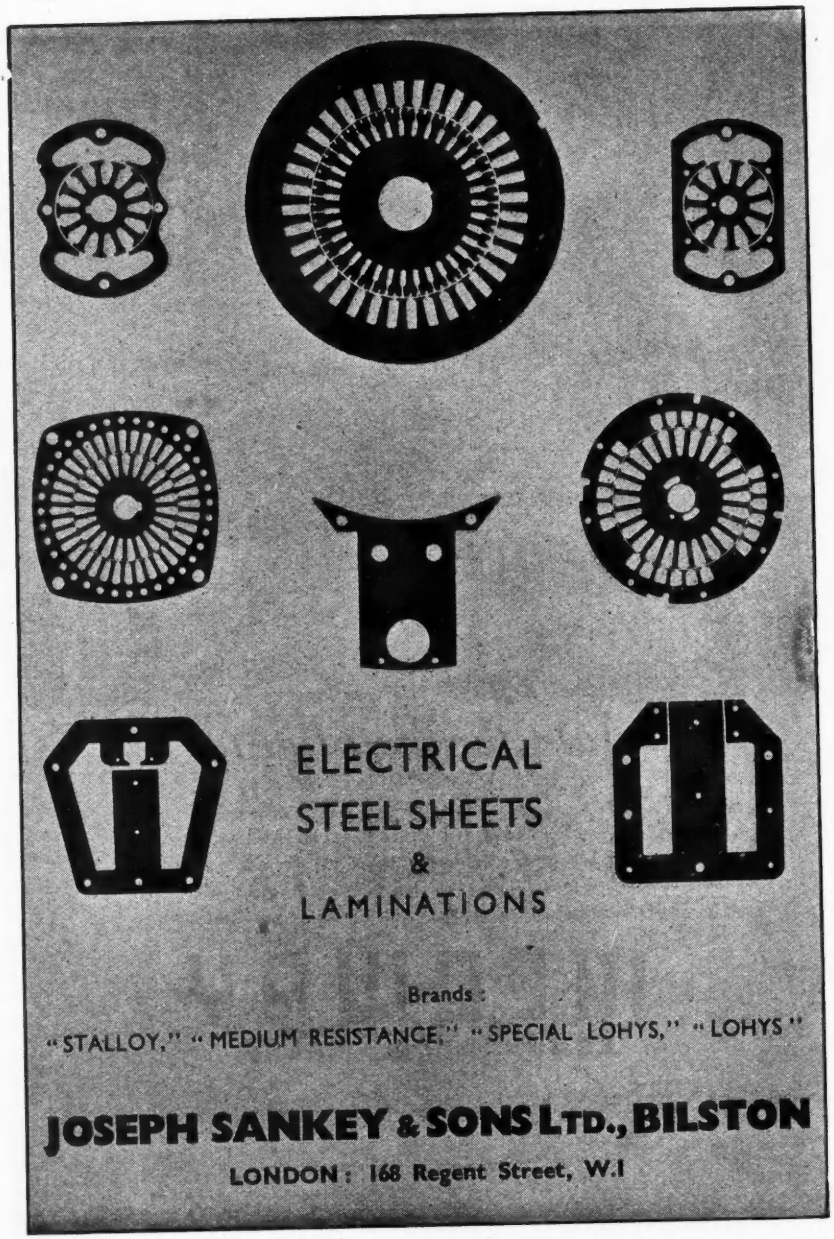
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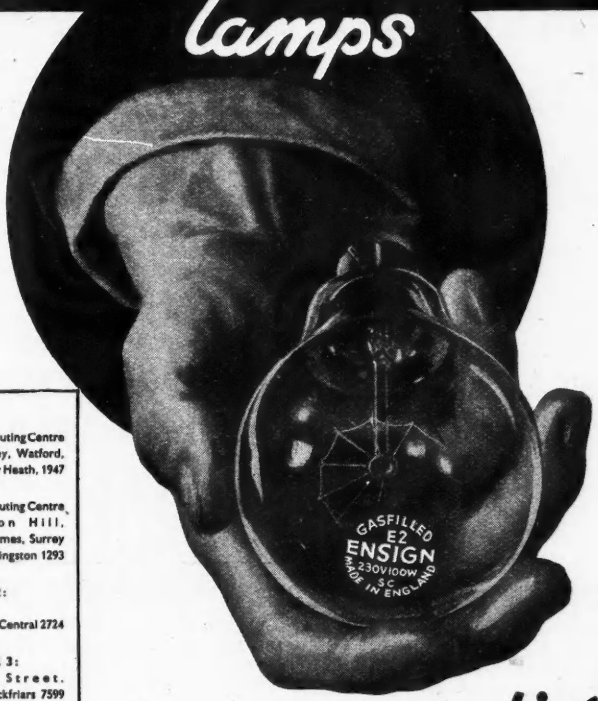

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WHAT TO SEARCH FOR

Here is a list of some of the important non-ferrous metal articles, parts and equipment likely to be found on your premises. Use it as a guide to your search for everything you can spare.

COPPER — cable, electrical parts and fittings, sheathing, tube, turnings, wire.
ZINC — sheet, cuttings.
LEAD — covered cable, pipe, sheet, solder.
WHITE METAL — anti-friction metal, plumbers' jointings, solder waste.
BRASS — pipe, sheet, tube, turnings.
BRONZE — bearings, bushes, cocks, couplings, crown wheels, junction boxes, unions, valves.
ALUMINIUM SCRAP (and its alloys) — pipe, sheet, castings, tube, turnings.

HOW TO DISPOSE OF IT

1 Sell your non-ferrous scrap to a Merchant.
2 Or hand it in to a Local Authority Depot.
3 SPECIAL COLLECTIONS of amounts over ONE TON may be obtained by getting in touch with the nearest Demolition and Recovery Officer. If you don't know his name, write to The Ministry of Works & Planning, Lambeth Bridge House, London, S.E.1.

NOTE: Under the provisions of the Scrap Metal (No. 2) Order, 1942, if you are in possession of more than 3 tons of Scrap Metal, it is now an offence not to disclose the fact to The Ministry of Works & Planning, Lambeth Bridge House, London, S.E.1.

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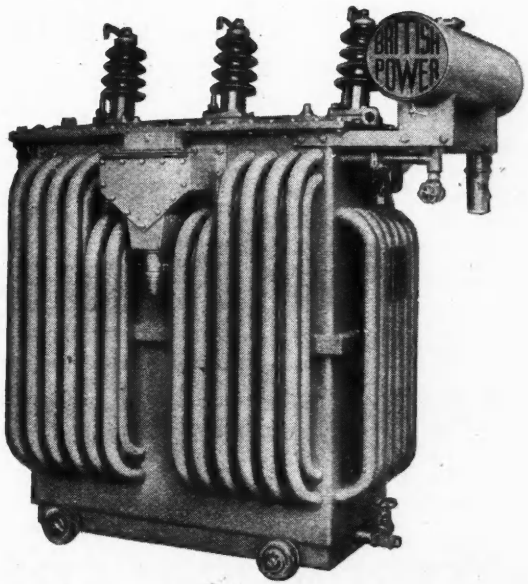

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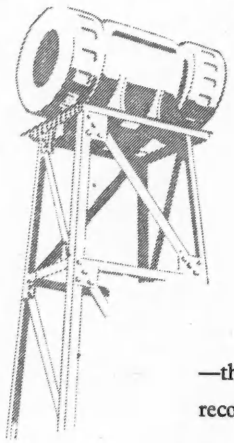

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ELECTRICAL REVIEW

Volume CXXXI — No. 3392

Friday, November 27, 1942

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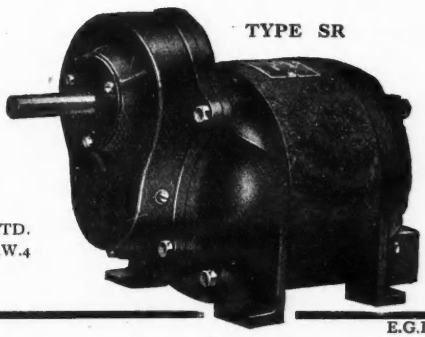

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Electricity for All

Footing the Bill

WHY is it that from its earliest days electricity has had a singular fascination for politicians? We suppose that in the first place the protection of existing interests was the predominant influence, but later legislation or legislative proposals have been inspired by other considerations.

Generally speaking, there are two ways of thought among politicians. The first regards electricity as a threat to the gas industry and seeks to define its " proper " place. The other is ostensibly friendly, but if ever an appeal for deliverance from friends was warranted it is in this case. In the view of this party, electricity is indispensable, therefore everybody must have it and have it at the same price. It matters nothing to them that variations in electricity charges are, to say the least, no worse than in the case of gas.

What is the Grid For?

They do not advocate gas for every remote and tiny cottage, for they know that this is impracticable. But because the grid strides across the countryside they see no reason why these far-flung dwellings should not have a supply of electricity. When matters are explained to them they remain unperturbed ; the cost must be borne by the system as a whole, that is, the urban consumer must meet any deficit.

We have always objected to the electricity consumer paying more than his fair share through rate relief contributions from electricity profits. This is another way of doing it, but surely a social burden of this kind should be carried by the whole community, not by one section of it. The Scott Committee cited the Post Office as a case parallel to electricity supply. This is an overworked comparison of two very dissimilar services which will not bear close examination.

Country dwellers should most certainly have electricity wherever common sense is not against it. If it cannot be supplied on a strictly sound basis financially it may yet be possible to make some arrangement to reduce the cost to the rural consumer to a level which he can afford. In this connection the proposals of the McGowan Committee were more reasonable than those set forth in the Scott Report.

An American Example

In our issue of November 20th, we reported the recent activities of the United States Rural Electrification Administration. This body was formed to give supplies to country districts and it does so on a self-supporting basis. The prospective consumers get together to form " co-operatives " and these are lent money on reasonable terms to enable them to wire homes and farms and set up distribution systems. The plan is evidently meeting with some success, and it should be possible in this country, with its shorter distances and with its agriculture on a better footing than before the war, to institute somewhat similar schemes.

If " economic " supply is not possible and it is considered essential to national well-being that remote rural communities

and isolated farmsteads should have electricity, then obviously any financial assistance for this purpose should be provided nationally. This, presumably, will be one of the matters considered when post-war plans are made.

Light and Sight

WHEN the Ministry of Fuel began its economy campaign we deprecated the insistence upon the reduction of lighting to save an almost insignificant amount of electricity. It seemed to us to be a strange form of economy which was likely to ruin the eyesight of thousands of people. Consequently we were not in the least perturbed when it was announced that it was impossible to increase the output of lamps of the lowest wattages for domestic use. The substitution of these lamps for others of adequate power had already gone too far; much greater and less dangerous economy can be achieved by avoiding neglect in the matter of leaving on unwanted lights.

Unjustifiable Risks

ADDITIONAL strain is often thrown upon those in a supervisory capacity by the very keenness of operatives to increase war output. Numerous instances have been brought to our notice of the risks incurred by men who, owing to the shortage of skilled labour, are only relatively experienced in electrical matters. More often than is justified by results does a failure to appreciate what precautions are necessary when working on live gear lead to damage to apparatus, as well as personal injury. Thus more time is lost than would have been the case had normal procedure been followed.

An Open Secret

SOME wonderment has been aroused by an advertisement inviting applications for the post of engineer and manager of an electricity undertaking at a salary of £1,875 per annum, such applications to be sent to the Incorporated Municipal Electrical Association. Those interested in the matter will have known immediately to which undertaking the advertisement related, so the only mystery is why this indirect method should have been adopted. It was not an attempt to circumvent the A.M.E.E.—E.P.E.A. Joint Committee (whose secretary has sent us a letter on the subject) for the salary is in accordance with the "Walker" scale. Upon inquiry the magic word "security" was mentioned—a word which may mean much or nothing.

Controlled Space Heating

IN the relatively mild climate of Great Britain, where marked variations in atmospheric conditions occur from day to day, the economic advantage of automatic time and temperature control of "heat-machines" can be fully exploited by electrical methods. Considerable savings of energy are to be made if the power used follows closely the difference between internal and external temperatures. The data presented by Mr. R. Grierson in this issue is a useful contribution to the present fuel-economy campaign, but the principles hold good at all times.

Porcelain Insulators

THE characteristics of porcelain insulators raise several points of more than academic interest. There is, for instance, the question of the need for glazing it all, since the unglazed porcelain has to possess all the electrical characteristics required and no reliance is placed on the insulating properties of the glaze. Also, if the porcelain is covered with a glaze, why not make the whole insulator of similar material? Again, if the cross section of the glaze area is less than one per cent. of that of the porcelain, and if the mechanical characteristics of the glaze alone are not superior to those of the porcelain, how can a glaze so considerably increase the mechanical characteristics of the insulator? Information on such matters is given in an article on a later page.

M.I.E.E.

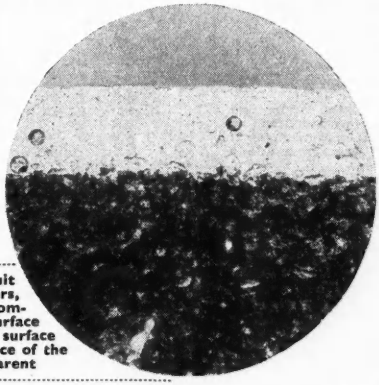
A COUPLE of weeks ago we referred to the decline during recent times in the proportion of full members to the total membership of the Institution of Electrical Engineers. The procedure of transfer of eligible associate members can legitimately be simplified by omitting from "Form T" any reference to a candidate's professional career prior to his becoming an associate member. While the later details included should be initialled by proposers and supporters as far as possible, there is no need to get into touch with those whose recollection of one's youthful exploits must be dim, even if they are still among us to bear witness.

Insulator Glazes

Their Influence on Porcelain

By E. Rosenthal, Dr.Ing.
(Ceramic Consultant, Bullers, Ltd.)

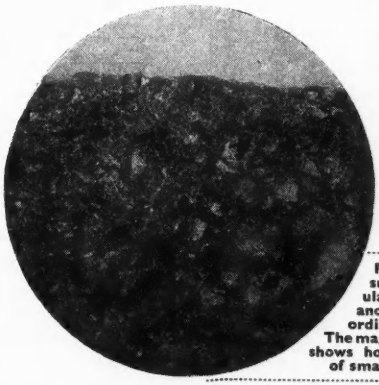
UNGLAZED ceramic materials appear to the naked eye to have smooth surfaces, but under a strong microscope minute projecting peaks can be observed. The quality of the surface has a great bearing on the surface resistivity of an electrical insulating material. Surface resistivity is largely dependent on the humidity skin which, in a moist atmosphere, forms on any surface to a thickness that increases with the surface roughness and with the humidity content of the atmosphere. The surface resistivity of the same material decreases with the increasing humidity content of the atmosphere. For instance, with 30 per cent. humidity, the surface resistance of unglazed porcelain ranges between 20×10^{12} and 40×10^{12} ohms per cm.^{2}, but in an atmosphere of 98 per cent. humidity it is only about $0{\cdot}001 \times 10^{12}$. This decrease in surface resistivity is smaller the smoother the surface.



Junction of glaze and biscuit magnification 75 diameters, showing how the glaze combines with the porcelain surface and dissolves parts of its surface layer. The smooth surface of the glaze will be apparent

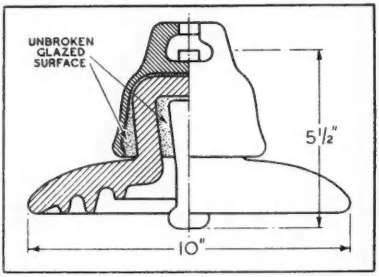
Glazed porcelain has, in a dry atmosphere, approximately the same surface resistance as unglazed porcelain, but in a humid atmosphere of, for example, 98 per cent. humidity the figure becomes $0{\cdot}1 \times 10^{12}$ ohms per cm.^{2}. This dependence of surface resistivity on the quality of the surface and on the humidity content of the atmosphere is a characteristic not only of porcelain but also of all insulating materials.

A porous material shows a much more rapid decrease in the surface resistance with increasing atmospheric or surface humidity. Porcelain is an absolutely dense and vitrified insulating material, and this is the reason why the surface resistance in a highly humid atmosphere is only 200 times smaller than in a dry atmosphere (for glazed porcelain), whereas in the case of porous materials the surface resistivity in atmosphere of 98 per cent. humidity is more than a million times smaller than in a dry atmosphere. The considerable improvement of the surface resistance under humid conditions by the application of a glaze is one of the reasons for the latter. Another reason is that a matt unglazed surface would more quickly collect dust, smoke and all kinds of impurities. Glazed surfaces can much more easily be cleaned automatically by rain or, for instance, with damp rags. All insulators used in the open air and most of those used in enclosed rooms are, therefore, provided with a ceramic glaze. (Most specifications for porcelain high-voltage insulators state that the glaze shall cover all the exposed porcelain parts of the insulator but that it shall not be depended upon for insulation.) The latter provision means, in



Rough, unglazed porcelain surface section perpendicular to the unglazed surface and photographed under ordinary transmitted light. The magnification of 75 diameters shows how the surface is formed of small undissolved particles

effect, that the porcelain body must be free from pores and possess after immersion in water, in an unglazed state, the required dielectric strength.



Cap-and-pin suspension insulator : Porcelain having unbroken glazed surface subjected to compressive stresses. Electro-mechanical strength B.S.S. 6804 kg. Average breaking load 9,000 kg.

As a rule only those parts are left unglazed where, for one reason or another, a certain roughness is required, *e.g.*, where metal parts have later to be affixed by cement or, as in the case of ceramic articles, used on indoor apparatus, where high surface resistance is not essential.

The glaze on a porcelain insulator is composed of similar raw materials to those used for the body, but fluxes are added which cause the mixture to melt at the firing temperature of the insulator (1,300 to 1,400 deg. C.).

Insulators are clay-dipped, as the potters say. This means that the glaze is applied by dipping when the insulator is in a dry state but before it is fired. Instead of immersing the insulator in a watery glaze suspension, the glaze may also be applied by spraying.

In domestic and art porcelain manufacture, the glaze is applied on a pre-fired article, but it was discovered very early that this was not necessary for thick-walled articles for electrical purposes. Later it was found that it was not even necessary for thin-walled ones if precautions were taken to prevent deformation during dipping. Glaze spraying is one of the means of preventing this deformation.

Only seldom is a low-temperature melting glaze applied to a pre-fired insulator, for instance, if certain coloured glazes have to be applied which would not withstand the temperature to which the insulator is subjected during firing. (The remarks which follow with regard to improvement of the mechanical characteristics of the body by virtue of the glaze do not apply to this type of glaze.) High-temperature insulator glazes (fired at a temperature of 1,300 deg. C. and higher) have not only a very great influence on the surface resistivity of the insulator but also on its mechanical and physical characteristics.

One of the most important factors which influence the mechanical characteristics of the glazed body is the ratio of the heat expansion of the glaze to that of the body. There is no general agreement as to which ratio is the most favourable. In early days the opinion held was that both glaze and body should preferably have the same coefficient of thermal expansion.

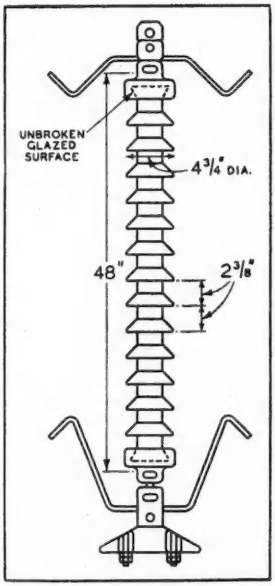
Subsequent investigations proved, however, that such a simple law did not apply. These investigations disclosed that the most suitable glaze has to be found by numerous experiments (by trial and error) for each and every body.

The tensile strength, the modulus of rupture and the other mechanical characteristics may be improved very considerably by the application of a glaze the thermal coefficient of which bears the proper ratio to the thermal coefficient of the body.

The resistance to sudden temperature changes, however, may be more favourably influenced by another glaze.

If the thermal expansion of the glaze does not agree with that of the body, a considerable decrease in mechanical strength may result.

These phenomena have nothing to do with the mechanical strength of the glaze itself. Taking a cylindrical test specimen covered with a thin glaze, the cross-sectional area of the glaze is exceedingly small compared with the cross-sectional area of the porcelain. The



Suspension insulator : Long-rod (Motor) type, originally designed by Motor Columbus Co., Baden, Switzerland. Porcelain having unbroken glazed surface subjected to tensile stresses. Working voltage 110 kV. Maximum working load 3,600 kg. Minimum breaking load 6,200 kg. Flashover, dry 950 kV, wet 315 kV, at 50 cycles

glaze may, however, decrease or increase the mechanical strength of the test specimen by 50 per cent. The fact that the use of certain glazes so considerably improves the mechanical characteristics of the insulator can be explained by the stress conditions prevailing in the glaze and in the surface layer of the porcelain body. If stress conditions in the glaze are not correctly related to those in the insulator body, the elastic limit of the glaze may be reached and thus different kinds of failure of the glaze may occur.

Crazing and Peeling

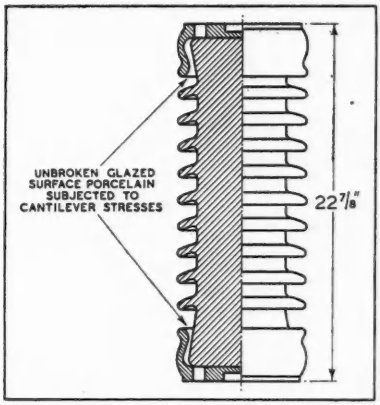
If we take the case of a porcelain rod which is covered by a glaze having a greater heat expansion than that of the rod, then when both are cooling down in the kiln the glaze has a tendency to assume a smaller length than the rod. The rod, however, takes a firm grip on the soft and viscous glaze and will not allow the glaze to shrink more and to follow its natural tendency to become smaller than the rod. In other words, the glaze (while sticking firmly to the rod when rod and glaze are cooling down) is subjected to tensile stress, being prevented by the rod from assuming its natural smaller cold-state length. This tension may cause rupture of the glaze either during cooling or later on in service as the result of some external cause. This breaking usually takes the form of numerous cracks and is generally known as " crazing."

The contrary applies if the glaze has a smaller heat expansion than the body. In this case when both are cooling after firing, the glaze contracts less than the body. It has a tendency to assume a greater length than the rod. The rod, however, will not allow the glaze to acquire a greater length than itself. In other words, the glaze is compressed to a smaller size than that which it would possess if it were not compressed by the porcelain rod. This stress may also cause rupture of the glaze, but in this case it shows itself in another form than that described in the case of a glaze having a greater coefficient of thermal expansion. The glaze is pressed away from the porcelain, this phenomenon being called " chipping " or " peeling."

Increased Tensile Strength

Many experiments have been carried out in different countries and the results have been published by various authorities. In the United States, Rowland (*Electrical Engineering*, 55 No. 6, 618, 1936) reports that in special cases the tensile strength is increased as much as 80 per cent. by a suitable glaze and an increase of 40 per cent. is quite normal. Similar results have been obtained by Continental research workers, the tensile strength of unglazed porcelain being given as 240 to 320 kg. per cm.^{2} and of glazed porcelain as 300 to 500 kg. per cm.^{2}. Tests carried out in English factory laboratories give similar results.

The application of a suitable glaze not only increases the tensile strength but also the other mechanical characteristics. For instance, the compressive strengths of unglazed cylindrical test specimens possessing cross sections of 160 cm.^{2}, 80 cm.^{2} and 20 cm.^{2} are 900, 1,000 and 1,700 kg. per cm.^{2}. Corresponding figures for glazed cylinders are 2,000, 2,300 and 4,300 kg. per cm.^{2}. The above figures are minima, not maxima (*i.e.*, when the porcelain begins to crumble).



Line-post solid-core insulator. Porcelain having unbroken glazed surface—subjected to cantilever stress. U.B.S. cantilever 1,300 kg. Flashover voltage, dry 200 kV, wet 147 kV, at 50 cycles

These considerations apply only to porcelain glazes which fuse at the maturing (vitrification) temperature of the porcelain as generally used in high-voltage insulator manufacture.

Application to Finished Articles

Glazes which are applied to the finished ceramic article and which are fused in a second firing at a lower temperature, behave differently and are not able to increase the mechanical stress of the ceramic article. (For instance, in earthenware manufacture, and as mentioned above, in certain insulator manufacture.) In contra-distinction to high-voltage insulator glazes, this type of glaze must contain strong fluxes like lead oxide, etc., which are not contained in the porcelain body.

These glazes form, with the surface layer of the porcelain, combinations which may behave very differently from the body. The composition of the glaze does not in this case play so predominating a part as in the

case of high tension insulator glazes. Other considerations are of equal importance.

Insulator glazes are composed, as mentioned above, of similar materials to those of the body, *i.e.*, clay, silica and feldspar, but their proportion is such as to decrease the fusing point. This means that the feldspar content is considerably increased, but the clay content accordingly decreased as compared with that of the body. Smaller amounts of other fluxes, such as dolomite, magnesite or lime, may be added in order to impart to the glaze the most suitable fusing temperature and the most suitable coefficient of thermal expansion. Such fluxes, insofar as they are not contained in the composition of the body have, however, to be used only in such small quantities as not to make the glaze too dissimilar to the glassy matrix formed in the porcelain body during the firing process.

In insulator design, much use is made of the strengthening effect of the glaze on insulator bodies. Previously, the attachment of the porcelain to the metal work was facilitated by the provision of unglazed or partially glazed surfaces in contact with cement. In present-day designs in place of the conventional form of insulator head a smooth and unbroken glazed surface—especially in the design of cap-and-pin insulators—has been introduced.* Other types which make use of the strengthening effect of the glazes on insulator bodies are solid-core line and station post insulators, and the so-called motor and long-rod (Langstab) insulators which are used on the Continent to a very great extent as suspension and strain insulators.

In the case of glasses (which have many similarities to ceramic glazes) it has been found possible to calculate the thermal expansion if the composition of the glaze is known.† The exact heat expansion of glazes cannot, however, be calculated from their composition, the reason being that, firstly, glazes are not true glasses, but are still partially opaque and, secondly, a vivid interaction takes place between the glaze and the body. The composition of the fired glaze is, consequently, quite different from the composition of the raw materials of which the glaze is composed.

Another important difference between porcelain glazes and glasses is that the former are fired in the oven at a temperature which matures or vitrifies the porcelain (1,300 to 1,400 deg. C.), which is higher than the softening temperature of glass. This makes the use of a very high silica and alumina content possible for insulator glazes. The high silica and alumina contents explain the great hardness, mechanical strength and resistance to chemical attack of glazes.

I would like to thank Lomax Palæo-Botanical Laboratories, who have made up the photomicrographs for this article, and Bullers, Ltd., for valuable information and the sketches of the suspension insulator and the line post solid-core insulator.

* Preface, Cap and Pin Insulator Catalogue, Bullers. Ltd.

† Winkelmann and Schott—"Ann. d. Phys. u. Chem." (1894.)

Submarine Cable Repairs

A PAPER entitled "Salvaging, Relaying and Jointing Submarine Power Cables," by Mr. J. C. A. Fraser, mains engineer to the Sydney County Council, which has been published in the *Journal* of the INSTITUTION OF ENGINEERS, AUSTRALIA, describes a method adopted to joint and replace in its original position a 33-kV submarine cable which had been fouled by a ship's anchor.

The cable, an important one in Sydney Harbour, was dragged a maximum distance of 220 ft. upstream and was severed at about 180 yd. from one end and 420 yd. from the other. The simple method of inserting a length of new cable with two joints was rejected on account of the hazard of the cable in its new position being fouled by anchors, and also because it was impracticable to anchor the jointing lighter in such a heavy traffic area. It was also considered impracticable to move the cable back into its original position by underrunning it, because of its weight (the longer section weighed 14 tons) and the possibility of damage to it and other cables. The only other method that presented itself was to salvage the cable in good condition and relay it along its original route.

Of the various means considered for salvaging the cable the one which offered the best prospects of speed and simplicity consisted of utilising a power-driven cable drum to raise the cable and roll it on the drum in one operation. A flush deck lighter was available fitted with a steam winch with two warping heads or nigger heads to provide the motive power for driving the cable drum. It was decided, therefore, to effect the drive by means of ropes fleeted over these nigger heads and "warping rings" bolted to the cheeks of the drums.

As the cable was brought aboard, the lighter was warped slowly ahead by means of hand winches. The direction of the lighter over the cable was controlled by the relative speeds of the forward hand winches and the rate at which the stern anchor rope was paid out. The average rate at which the cable was recovered, excluding the time for placing anchors, etc., was a little over 300 ft. per hour.

It was decided to relay the cable by warping the lighter on anchors in a similar manner except that the steam winch provided the power for the warping operation. The paying out of the cable was controlled by means of a drum brake.

Unbalanced Loads

A Simple Method for Three-Phase Circuit Calculations

By G. W. Stubbings, B.Sc., A.M.I.E.E.

THE most general method of solving electrical circuit problems is by the direct application of Kirchhoff's laws. Although, theoretically, this method is quite straightforward, the algebraic manipulation required to obtain explicit results can be very complicated and, for practical use, alternative methods of calculation are often desirable.

There are several such alternative methods which are suited to particular circumstances. One of the simplest depends upon Thevenin's theorem, which states that a network of impedances and EMFs connected to two

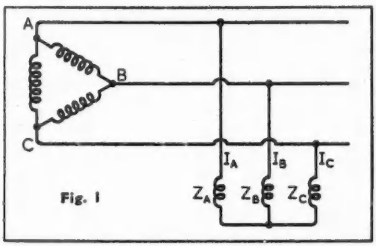


Fig. 1

open points or terminals can be considered equivalent to a single EMF and a single impedance equal respectively to the potential difference and the parallel impedance between the terminals.

This theorem leads to the following practical rule for circuit calculations. If two points of a network are joined by an added branch, the change in the potential difference between the terminals so caused will be equal to the product of the current in the added branch and the parallel impedance of the original network between the terminals.

A corollary to this rule may be thus stated : If two points of a network are short-circuited, the potential difference between these points before short-circuiting is equal to the product of the current in the short-circuit and the parallel impedance of the network between the short-circuited points. The applications of Thevenin's theorem for the solution of circuit problems are so versatile that it is surprising how this theorem seems to be ignored in most of the elementary textbooks on electrical technology.

The second of the above rules leads to a direct and easily remembered method of solving the otherwise difficult problem of calculating the currents in an unbalanced star-connected three-phase load, if it can be assumed, as is usually possible, that the supply voltages are fixed and unaffected by the loading.

The usual methods for the solution of this problem depend upon the assumption of an objective neutral of the supply ; in the method proposed no such assumption is necessary. An unsymmetrical star load is represented diagrammatically in fig. 1 ; it consists of three impedances Z_A, Z_B and Z_C, and the source and line impedances are assumed to be negligible. Let one unit, say Z_A, be short-circuited and let the current in the short-circuit be I'_A. Then if V_A is the potential drop on Z_A before short-circuiting, and Z_P is the parallel impedance of Z_A, Z_B and Z_C, then according to the rule given above $V_A = I'_A Z_P$ so that the original current in Z_A is given by $I_A = I'_A Z_P / Z_A$.

These expressions are, of course, vector equations. If I'_B and I'_C are respectively the currents in short-circuits to Z_B and Z_C, then it follows similarly that $I_B = I'_B Z_P / Z_B$ and $I_C = I'_C Z_P / Z_C$.

The rule for determining the current in any unit of a star-connected load can therefore be thus concisely stated in words : Find the vector of the current in a short-circuit to this unit and multiply this vector by the vector ratio of the parallel impedance of the three units to the impedance of the one short-circuited. The short-circuit current to any unit is, of course, found in the straightforward way, and an expression for this current can easily be written down in terms of line voltages and impedance values of

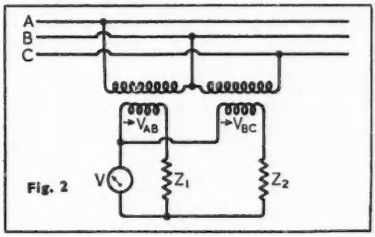


Fig. 2

units carrying this current. The formulæ given above are so simple and symmetrical and so easily remembered that there is really no need to do this, as the working from these formulæ to the required explicit result is quite direct.

Apart from its utility in circuit calculations, the formula $V = I'Z_P$ gives an immediate

answer to some questions the direct treatment of which requires a considerable amount of algebraic symbolism. Thus, consider the usual arrangement, fig. 2, for measuring sequence voltages, where Z_1 and Z_2 are impedances of equal ohmic value but with phase angles differing by exactly 60 deg.

It is easy to see that the current in a short-circuit to the instrument V is proportional to a sequence voltage because it is proportional to the resultant of two actual line voltages with their phase difference altered by 60 deg., but it is not at all self-evident that the current in the appreciable impedance of the instrument V is also proportional to the sequence voltage. That it is so can be established by a direct application of Kirchhoff's laws, but the rule used above shows at once, without further calculation, that the pressure on the voltmeter terminals, being proportional to the short-circuit current, is also proportional to a sequence voltage, for the parallel impedance of the three units is a circuit constant.

Similarly in the well-known Varley test for phase sequence the lamp voltages are proportional to the respective currents in short-circuits to them. If the lamp resistances

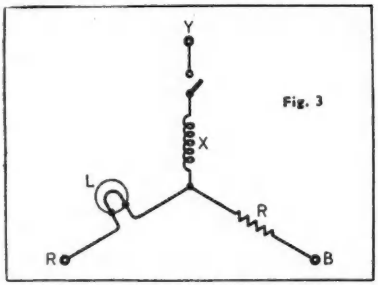


Fig. 3

are equal, it follows that the current in a short-circuit to the lagging-phase lamp must be greater than that to the leading-phase lamp, when the third unit is a reactor, for the reactance diminishes the phase difference of the components of the short-circuit currents in the one case and increases this phase difference in the other. Hence the well-known rule that with a reactor, the bright lamp shows the lagging phase.

The formula $V = I'Z_P$ can be used to deduce an interesting property of the star-connected circuit shown in fig. 3. This consists of a reactor X and a resistor R of equal ohmic values, and a lamp L the resistance of which is indefinite. The reactor can be disconnected at will by the switch shown. With X in circuit $V_1 = I'_1 Z_P$ where V_1 is the lamp voltage and I'_1 the current in a short-circuit to the lamp, Z_P being the parallel impedance of the three units.

With the reactor disconnected the same rule applies: $V_2 = I'_2 Z'_P$, where V_2 is the lamp voltage, I'_2 the current in a short-circuit to the lamp, and Z'_P the parallel impedance of L and R. It is easy to see that if L and R are in parallel the current passing into the combination cannot be doubled by connecting the reactor in parallel also, for the impedance of X is equal to that of R. Hence the magnitude of the ratio Z'_P/Z_P must be a number n which lies between 1 and 2. The ratio of the lamp voltages after and before connecting the reactor is therefore $V_1/V_2 = I'_1/nI'_2$.

Now I'_2 is the current in R when it is directly connected to a line voltage, and with balanced voltages and X in circuit I'_1 is seen to be equal to $2I'_2$ with the lamp connected to the lagging phase, for the components of the short-circuit current are equal and in phase. If, however, the lamp is in the leading phase, then $I'_1 = I'_2$, for the equal components of I'_1 have a phase difference of 120 deg. Thus, with the lamp in the lagging phase, according to the terminal markings of the diagram, $V_1/V_2 = 2/n$. As n is less than 2, this ratio is greater than 1 and the lamp voltage must increase when the reactor is connected.

If the lamp is in the leading phase $V_1/V_2 = 1/n$ and as n is greater than 1 the lamp voltage diminishes when the reactor is connected. Hence the circuit of fig. 3 can be used to determine phase sequence with any single lamp. The terminals are joined to the balanced voltage supply so that the lamp voltage increases when the reactor is connected ; the phase sequence then corresponds to the terminal markings.

Canadian Power Production

THE part played by electricity in Canada's war production, whose peak is expected to be reached in February, 1943, is mentioned in the October Bulletin of the Royal Bank of Canada. In the first seven months of this year the power output was more than 17 per cent. above that in the corresponding period of 1941, although that was a record. Large additions to hydro-electric installations are under construction, yet even these will not meet the total demand. Consequently, all forms of non-essential use of power are being curtailed in the principal centres of war industry. Only sufficient street lighting for public safety is allowed and all advertising and display use of power has been banned. This will mean a saving of 160,000 HP. Apart from this an additional 100,000 to 140,000 HP will be required to meet the demand this winter and further restriction of civilian use of electric power will therefore be necessary.

Mr. H. J. Symington, the Power Controller, is negotiating with newsprint companies in the St. Lawrence River Valley on a plan to stagger their days of operation and thus conserve power. It is believed that approximately 50,000 HP would be made available for the production of aluminium and other war materials should the plan succeed. Under the scheme, each mill would operate six days a week.

Space-Heating Machines

Controlling the Power Developed by those of the Hot-Water Radiator Type

By R. Grierson, M.I.E.E.

PROBABLY the large majority of space-heating machines of the electrical thermal storage or other types are—like motor cars—not fitted with any form of automatic governor, but depend upon the attendant or driver to adjust the load or flow-pipe temperature in accordance with the day-to-day and hour-to-hour demands of the Clerk of the Weather. The effect that a small change in the temperature of the flow-pipe has on the consumption of heat energy is not, however, widely appreciated.

Many, if not the majority, of central hot-water radiator installations are designed to maintain an internal temperature of 65 deg. F. in offices and living-rooms, and 55 deg. F. in entrance halls, lavatories and on landings, staircases and the like, with an external temperature of either 32 or 30 deg. F., so that the mean internal temperature of the heated space approximates to 60 deg. F. The maximum temperature *difference* to be maintained between the internal and external temperatures is therefore either 28 or 30 deg. F., so that one of these values represents the 100 per cent. load condition to be carried by the space-heating machine.

Hot-water radiators and pipes transmit heat energy to the ambient air and to the adjacent structural surfaces by the combined action of convection (approximately 85 per cent.) and radiation (about 15 per cent.), so that the graph which connects the mean water temperature in the radiator with the heat energy transmitted to the ambient air and adjacent structural surfaces is proportional to the 1·3 power of the *difference* in temperature between them and the ambient air. Assuming, for the purpose of illustration, the temperature of the main flow-pipe to the radiators to be 180 deg. F., and that the connecting pipe-work (transmission and distribution system) has been designed for a pressure drop or temperature difference of 20 deg. F. between the flow and return connections to the water heater, thermal storage cylinder or boiler: when the external temperature is at 32 deg. F., the mean surface temperature of the radiators and pipes should be $\frac{180 + 160}{2}$ or 170 deg. F. Thus, the mean water-to-air temperature *difference* under the assumed conditions would be 170 (mean radiator) − 60 (mean ambient air, etc.) = 110 deg. F., and this thermo-potential represents the 100 per cent. full-load condition.

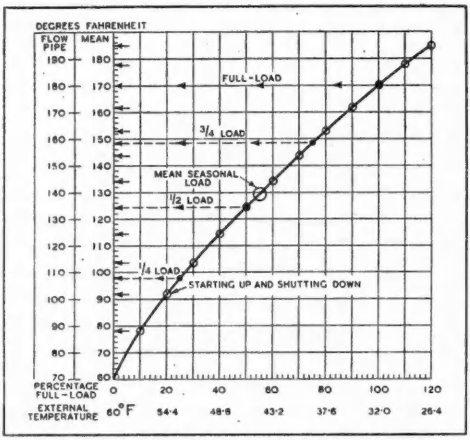
To ascertain the appropriate water temperatures for intermediate values of the external air temperature between 32 and 60 deg. F., in order that the power developed by the space-heating "machine" may be efficiently governed by the "driver," it is necessary to ascertain the several values of the water-to-air temperature difference (n) to the power of 1·3, *i.e.*, of $n^{1.3}$, corresponding to the intermediate loads, as shown in the accompanying table:—

Percentage of full load ..	0	10	20	30	40	50	60	70	80	90	100	110
External temperature deg. F.	60	57	54	52	49	46	43	40	37	35	32	29
$n^{1.3}$ deg. F.	0	45	90	135	180	225	272	315	360	405	450	495
n deg. F.	0	19	32	44	54	65	75	83	93	101	110	118
Mean radiator temperature deg. F.	60	79	92	104	114	125	135	143	153	161	170	178
Flow-pipe temperature deg. F.	70	89	102	114	124	135	145	153	163	171	180	188
Return flow-pipe temperature deg. F.	50	69	82	94	104	115	125	133	143	151	160	168

Desirable conditions for starting up and shutting down a space-heating machine are based on a flow-pipe temperature of 180 deg. F. (100 per cent. full load), and a return temperature of 160 deg., the mean radiator temperature being 170 deg. F. If the mean structural temperature is 60 deg. F., then the mean water-to-air temperature difference is 110 deg. As a general rule, a central heating installation would not be started up until the external temperature fell below 55 deg. F. (20 per cent. full load), and would be shut down when it rose above that point.

If the installation has been designed to operate on a 40 deg. F. difference in temperature between the flow and return connections to the water heater or "boiler," the mean temperature for the full-load condition is usually 160 deg. F., the corresponding water-to-air temperature difference is there-

fore 100 deg. F., and the corresponding value of $n^{1.3}$ is 398. Thus, the 20 per cent. load value of $n^{1.3}$ is practically 80, the water-to-

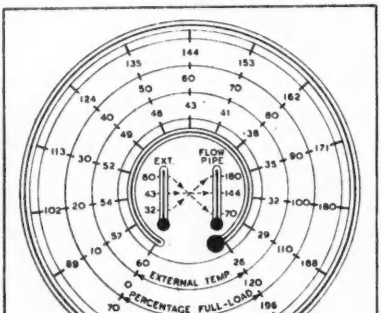


Variation of load on "machine" with variation of temperature of the flow-pipe

air temperature difference 29 deg. F., the mean radiator temperature 89 deg. F. and the flow-pipe temperature 109 deg. F.

"Fresh Air" *v.* Fuel Economy

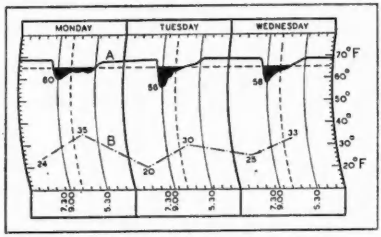
A sash-type window 2 ft. 9 in. wide, open only to the extent of 6 in., provides an effective cross-sectional area of 1·375 sq. ft. for the entry of cold, outside air. Taking the mean wind velocity at just under four



Load adjustment on space-heating machines

miles or 20,000 ft. per hour (which moves smoke but not wind vanes), then the air volume passing through the open window (providing that it can also leave by door or other egress) will be 20,000 ft. by 1·375 sq. ft. or practically 28,000 cu. ft. per hr. If the external air is at 30 deg. F. and the specified indoor temperature is 65 deg. F., then the increase of temperature required is 35 deg. F., and at 0·02 BThU per hr. per cu. ft. per deg. F., the total heat energy required per cu. ft. is 0·7 BThU per hr. or 0·206 W. It follows that the heating power required for the 28,000 cu. ft. per hr. passing through the window opening of 6 in. is 5·7 kW. If the room is warmed by means of a hot-water radiator, the temperature naturally falls and an electric fire is probably switched on to make good the deficiency in temperature, *when restriction of peak-loads and fuel economy are of vital national importance.*

Similarly, the opening to a loading bay in a small factory building has a superficial area of 57 sq. ft., and the air volume passing through it at a wind velocity of 4 m.p.h. is 1·14 million cu. ft. per hr. If the temperature in the factory is maintained at only 55 deg. F., calling for an increase of only 25 deg. F., then the heating power required is at the rate of 0·144 W per cu. ft. but, even so, the total



Thermograph chart taken in response to complaint of subnormal internal temperatures
A = Internal temperature; B = External temperature, offices occupied 9 a.m. to 5.30 p.m. Note effect on internal temperature of opening windows at 7.30 a.m. for "ventilation"

power required to deal with the fresh air passing through the opening to the loading bay is 1·14 million cu. ft. × 0·144 W, or a total load of 164 kW. Fuel economy demands that loading bays should be partitioned off from the factory area, and that the internal and external doors should not be opened simultaneously.

My thanks are due to Capt. J. M. Donaldson, general manager of the Northmet Power Co., for permission to publish the above data, which has been compiled for the information of the Company's staff.

Making Small Glassware

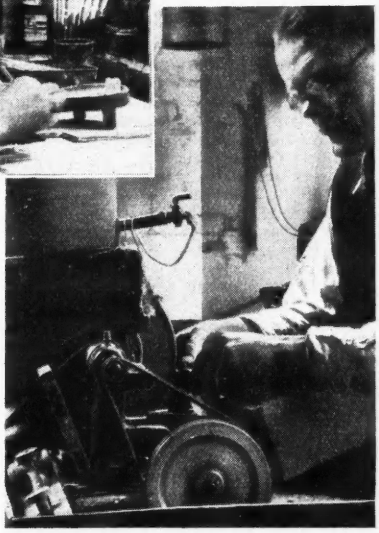
A New British Industry

SINCE the German occupation of Czecho-Slovakia many electrical manufacturers have been at a loss to know where to obtain adequate supplies of certain types of small glassware. They, in particular, will be interested to learn of an industry entirely new to this country, which the English Glass Co., Ltd., has established in the Midlands.

Formed in 1934 for the purpose of producing glass reflectors for cycles, etc., this company, in 1939, opened a jewellery stone and bead department, under the guidance of Czech craftsmen from the famous glass manufacturing town of Gablonz (Jablonec). From these beginnings the production of lenses of all kinds has been developed, in the first place for cameras and more recently for such articles as telephone switchboards, traffic signs, optical condensers and electrical switchgear. More recently still, now that the manufacture of glassware for jewellery has been abandoned in favour of articles associated with the war effort, it has been a simple step to change over production to glass insulators, including insulating beads.

Many of the processes involved in the manufacture of the glassware are secret ones which the Czech craftsmen have passed down from father to son. Lenses are moulded on the die-casting principle from raw glass replasticised at high temperatures in individual furnaces. Many types of presses are used, considerable skill and experience being necessary if the finished product is to be free from blemishes and distortions. The pressings are annealed, examined and trimmed by special equipment, and their edges are then ground. Many lenses for telephone switchboards must have a matt surface, and this is imparted by a process timed to give the right degree of opacity.

In addition to the pressing and turning departments, the company has a busy glass-blowing section, where women produce glass parts, such as those used in the medical and chemical industries.



Above: Stamping out lenses from the molten glass rods
Below: Grinding the edges of the lenses after they have been trimmed
Left: Making glass insulating beads

War Risks Insurance

Guidance for Electrical Traders

By F. E. Sugden, A.C.I.S., Barrister-at-Law

SINCE the War Risks Insurance Act was passed in 1939, there have been a number of Statutory Rules and Orders amending its provisions. Therefore it may be useful to summarise the effect of these as they are likely to affect electrical businesses.

The Act was designed to enable the Board of Trade to institute a scheme of insurance for persons carrying on business as sellers or suppliers of goods to cover their liability in the event of damage to their stocks by enemy action. This insurance was to be effected with agents acting on behalf of the Board of Trade. The Act not only applied to finished goods, but also to articles used in the manufacture of goods for sale.

It was provided that traders and others holding stocks worth more than £1,000 or having business equipment worth more than £1,000 should be included. Below these compulsory limits traders were not bound to insure if they did not wish to do so, but in this event they would not receive compensation if their stocks or equipment sustained war damage. The War Damage Act of 1942, however, provided that where a trader was not insured under the War Damage Act, 1939, and his goods were damaged as a consequence of enemy action, special exceptions could be made in suitable cases.

Immediate Payment

Omission to insure carries with it a liability to a fine not exceeding £100 and a further fine not exceeding £50 for every day on which the omission continues. Payment for losses is not deferred until the end of the war; persons who insure, or who are given special concessions by the Board of Trade, and whose stocks are lost by enemy action, will receive immediate payment of the value of their stocks. Claims must be made through an insurance company, which acts as agent to the Board of Trade. The company negotiates with a local committee set up for the purpose, and payment will immediately be made on account when authorised.

Apart from the provisions of sub-section 1 of Section 7 of the War Risks Insurance Act, this matter is also covered by the Defence War Risks Insurance Regulations, 1940, and Statutory Rules and Orders, 1940, Nos. 771, 1142 and 1288.

Sometimes the question arises whether the electrical contractor is a seller of goods. Sub-section 1 (*b*) of Section 15 of the War Risks Insurance Act, includes sellers of goods, or those acting as agents; it also covers suppliers of goods, which means persons carrying on business in the course of which they supply goods for the purpose of, or in pursuance of, contracts made by them for work, labour and materials.

Contractors and traders must be careful when they obtain insurance policies that they deal with an agent authorised by the Board of Trade. No person except those authorised by the Board of Trade can issue policies under the Commodity Scheme or carry on the business of insuring persons of the United Kingdom as sellers or suppliers of goods against "King's enemy" risks. Statutory Rules & Orders 1940 No. 771 briefly lays down, that apart from the War Risks Insurance Act, goods which are supplied under contracts for work, labour and materials, are again insurable if they are more than £1,000 in value. Where a person carries on business as a seller or supplier of goods of any description and owns the material from which the goods are made, even though the goods are not produced by the seller, they are still insurable. Representatives of the Board of Trade may at all reasonable times enter the premises of persons carrying on business to ensure that this Order is carried out.

Statutory Rules & Orders No. 785 provides that no person shall carry on any business in respect of any goods insurable under Part 2 of the War Risks Insurance Act, unless there is a policy in force, if it comes within the financial limits. S.R. & O. No. 996 which came into force on July 3rd this year, lays down that premiums for the period from September 3rd to December 2nd, 1942, shall be at the rate of 5s. per cent. per month.

Static Electricity

THE purpose of Circular C.438 issued by the U.S. National Bureau of Standards is to outline generally the various ways in which manifestations of static electricity introduce fire hazards or mechanical trouble, into many industries. The nature and origin of such charges are discussed and different methods of mitigating the appreciable risks associated with them are suggested. By defining conveniently suitable units for the quantities involved and stating quantitative relationships between them a basis is presented on which to develop such safety measures as may be required. Sources of such American equipment as conductive rubber, measuring instruments and neutralisers are mentioned, while the bibliography has been selected largely because the 31 references contain pertinent details for which space is lacking in the circular itself.

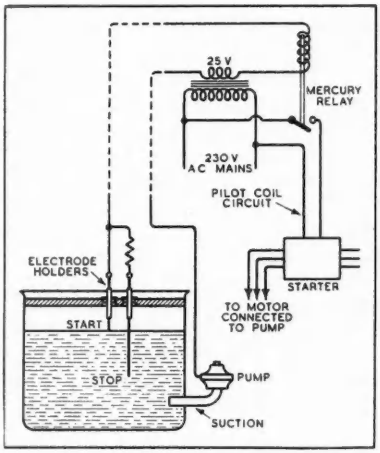
RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Liquid-Level Control

FLOATLESS control of the level of a liquid on the "Lectralevel" system (LONDEX, LTD., 207, Anerley Road, S.E.20), needs only one mercury switch of type LQA, 20 A at 440 V, for actuating the pump motor starter.

The method is intended more particularly for automatically filling a container, or maintaining the level of liquid within it, or for drainage. If the pump suction pipe is earthed and employed as one limb of the control circuit, only one wire will be needed from the electrodes to the relay, which functions at 25 V (maximum open circuit) to reduce risk of harmful shock. This low-voltage circuit is energised from a small double-wound transformer connected to the mains, while the pilot circuit from the relay to the motor starter may be at any commercial voltage.



Floatless liquid-level control circuit

The control circuit is completed through the liquid being pumped, when it rises sufficiently to immerse both electrodes, but the low operating voltage averts any need for elaborate insulation of the electrode holders. Satisfactory electrodes may be made of ordinary wrought-iron tubing; the shorter of the two is connected directly to the mercury relay, which starts the pump motor when the liquid rises high enough to make contact.

The longer electrode is connected to the same relay lead through a series resistance of a few ohms, the purpose of which is to pass sufficient current to hold the relay closed after the liquid level has dropped away from the shorter electrode.

Final fall of level below the longer electrode interrupts the relay circuit, the pump motor stopping automatically. It will not restart until both electrodes are again immersed because the auxiliary resistance in series with the longer of the two electrodes does not allow enough current to pass to tilt the relay, more being needed to close it than to hold it closed.

For cases in which the liquid is under pressure, or when insulated electrodes cannot conveniently be used, there is an automatic "Londex" level that inductively alters the magnetic relationship of two coils which respectively operate high- and low-level relays.

Cotton Sleeving

The latest product of P. P. PAYNE & SONS, LTD., Haydn Road, Nottingham, is a dielectric sleeving which is manufactured from the firm's own cotton tape. Samples received are unvarnished, suitable for low-voltage insulation. It is available in widths of from 0·5 to 10 mm. as a stock line in white and colours; other sizes up to 30 mm. diameter can be specially ordered. It is also being supplied printed for identification purposes when applied to cable ends, aircraft pipe lines, etc.

Oil-Immersed Ignition Coil

The improved insulation resulting from immersing in oil the windings of the "Oilcoil" ignition coil permits an output at 30,000 V without overheating. This results in the generation of more power and eliminates misfiring when using economical weak mixtures which remain unignited by sparks from an ordinary coil. On producer gas driven vehicles where increased compression ratio is used, the coil is particularly effective. Improved petrol consumption, better acceleration and climbing under heavy load conditions, reduction in the need for using lower gears, easier starting from cold and maximum benefit from low-grade fuel and petrol substitutes are some of the other advantages. The apparatus, which is available for either 6 or 12 V or both, is produced by RUNBAKEN ELECTRICAL PRODUCTS, Oxford Road, Manchester.

The "Oilcoil"

Heating Apparatus in Switzerland

The sale of electric heating apparatus increased considerably in Switzerland last year, states *Reuter's Trade Service* from Lausanne. From 1937 to 1939 the average yearly sale was 130,000 units, but in 1941 it rose to about 250,000.

Tariff Standardisation

Suggestions for a National Basis

By S. C. Harling, A.M.I.E.E.
(Deputy City Electrical Engineer, Chester)

STANDARDISATION of electricity supply tariffs has been the electrical economist's unfailing source of argument for many years, without however achieving anything other than adverse criticism. Much has been written purporting to show the impossibility of adopting a national tariff owing to the wide divergence in costs of production and distribution. Most commodities, however, vary considerably in the cost of production and distribution in various parts of the country, yet no difficulty is experienced in selling them on a standard *basis*, varying the price per unit quantity, in accordance with the cost of production and distribution plus a reasonable margin of profit.

The past policy of electricity undertakings of individually developing their own multitudinous types of tariffs, without any national co-ordination, is the cause of the present chaos and widespread public dissatisfaction. There should be no real difficulty in developing a national tariff, provided the fundamental principle is kept in mind that the price charged per kWh must bear a reasonable relationship to the cost of production and distribution and also to the consumer's demand and that non-trading consumers should bear a lower proportion of the cost.

The author's proposals take account of the undertaking's and consumer's load factors and differentiate between commercial and domestic supplies

Special Charges

The cost of taking a supply to a consumer, where considerable expense is involved owing to the distance or special equipment required, should be covered by a special charge in the same way as any other commodity would be. A standard basis of charge for electricity consumed could then be arrived at by incorporating in it the total cost per kWh to the undertaking and the load factor of the consumer expressed in relation to the load factor of the undertaking, the various classes of consumer being grouped under various percentages of the standard basic tariff.

The following formula represents an all-purpose tariff, the load factor and cost per kWh of the undertaking being based on the previous year's figures:—

$$\text{Price charged per unit} = CP \times \frac{\sqrt{LF}}{\sqrt{LF_1}} \times K,$$

where CP = total cost per kWh to the undertaking, LF = undertaking's load factor, LF_1 = consumer's load factor in kVA, K = constant of 1·0 for industrial and business consumers, 0·6 for "off-load" consumers and 0·4 for domestic consumers.

The consumer's load factor should be based on kVA (to encourage a good load factor) and registered on mass-produced watthour meters fitted with thermal-demand indicators. A simple block tariff could be offered. The example given in the accompanying table would apply to an undertaking with a total cost per kWh of 1d. and a load factor of 36 per cent.

The off-peak charges are 50 per cent. higher than the domestic charges in view of the effect of the relative load factors of the two supplies. Off-peak supplies are normally provided to special power consumers, heat-storage consumers and similar loads, all of which have good load factors bringing their costs down to the lower end of the priced scale.

Domestic consumers' load factors bring them on to the higher and middle portions of the scale, which represent the maximum prices at which domestic electrification can make progress. In practice the lower-priced end of the domestic scale and the higher-priced end of the off-peak scale can be ignored.

Not exceeding 50 kWh per annum per kVA	Domestic d.	Industrial d.	Off-peak d.
51 to 100	3·20	8·00	4·80
101 to 250	1·72	4·29	2·58
251 to 500	1·48	3·70	2·22
501 to 1,000	1·00	2·51	1·50
1,001 to 2,000	·72	1·78	1·07
2,001 to 3,000	·51	1·26	·76
3,001 to 4,000	·41	1·02	·61
4,001 to 5,000	·34	·86	·52
5,001 to 6,000	·31	·79	·45
6,001 to 7,000	·28	·71	·43
7,001 to 8,000	·27	·67	·41
	·25	·62	·37

Iron and Steel Institute Meeting

THE autumn meeting of the Iron and Steel Institute is to be held at the Royal Victoria Station Hotel, Sheffield, on Thursday, December 10th. At the afternoon session, starting at 2.30 p.m., there is to be a joint discussion on five papers, and at the evening session (5.15 p.m.), the Second Report of the Moulding Materials Sub-Committee is to be discussed.

PERSONAL and SOCIAL

News of Men and Women of the Industry

Government Changes.—It was announced this week that Sir Stafford Cripps was to succeed Col. J. J. Llewellin as Minister of Aircraft Production and that Lord Cranborne was to be Lord Privy Seal. Sir Stafford's place in the War Cabinet will be taken by Mr. Herbert Morrison, Minister of Home Security and Col. Llewellin is becoming Minister Resident in Washington for Supply. Mr. Eden, Foreign Secretary, succeeds Sir Stafford Cripps as Leader of the House of Commons and Col. O. Stanley is to take Lord Cranborne's place as Secretary for the Colonies.

Four members of the staff of the Lancashire Electric Power Co. have recently won distinctions. **Commander W. J. Henton Jones** (Generation Department), previously mentioned in dispatches, has been awarded the D.S.O. for bravery and resolution while escorting an important convoy to Malta. **Sergt. J. A. Wilcock** (Mains Department) has received the British Empire Medal, and **Lieut. H. Ashworth** (Mains Department) and **Stoker P. O. N. Coucill** (Generation Department) have been mentioned in dispatches.

Mr. J. R. Pheazey has been appointed works director of Standard Telephones & Cables, Ltd., and will be responsible for the manufacture and production at all the company's plants. Mr. Pheazey, who has been with the company for thirty-one years, received his training at the Woolwich Polytechnic and after experience on the engineering side of the company he became successively technical superintendent, operating superintendent and works manager at North Woolwich. He has visited the United States and Canada and for four years was general manufacturing adviser to one of the largest concerns manufacturing electrical communication equipment in the Far East.

Mr. J. R. Pheazey

In consequence of the death on active service of Mr. D. S. Cleaver, managing director, **Mr. J. W. Tarry** and **Mr. I. J. Kightley** have been appointed to join **Mr. V. H. Purdy** as directors of E.M.F. (Electrical), Ltd., Northampton.

Mr. H. S. Rentell has been elected chairman of the Junior Institution of Engineers for the current session. The vice-chairmen are **Messrs. J. Calderwood, M.Sc., and R. Lowe.**

Mr. W. F. Edgerton, who recently retired from the position of sales manager of the West Ham Corporation Electricity Department, has received from his colleagues two pieces of electrical apparatus and National Savings Certificates. The presentation was made by Mr. J. W. J. Townley, the borough electrical engineer. Mr. Edgerton was with the Croydon and Barking electricity undertakings before going to West Ham in 1906 as meter superintendent. He became assistant sales manager in 1909 and sales manager in 1919.

Mr. H. E. Rogers, mains engineer in the Leicester Corporation Electricity Department, is retiring after forty-two years' service, and has been presented with a gold watch by members of the Department. The presentation was made by Mr. J. Mould, the borough electrical engineer.

Mr. P. S. Turner has been appointed assistant managing director of Associated Electrical Industries, Ltd. Mr. Turner has been a director of the A.E.I. since 1939. He is also on the boards of the Metropolitan-Vickers Electrical Co., Ltd., the Edison Swan Electric Co., Ltd., and Edison Swan Cables, Ltd.

He is an authority on railway electrification, and his work in connection with the electrical equipment of the Hungarian State Railways is well known both here and in Hungary.

Mr. P. S. Turner

Mr. G. A. R. Mead has been appointed a managing director of the Skefko Ball Bearing Co., Ltd

Mr. H. E. Humphries has been appointed, as from October 1st, to take charge of the commercial and engineering activities of Siemens Bros. & Co., Ltd., in regard to telephone apparatus, exchange equipment, carrier, wireless, marine and other apparatus work. *Siemens Magazine*, the company's house journal, states that before joining the company Mr. Humphries was for ten years on the technical staff of the Australian Post Office. His early years with Siemens were spent on development work, principally in connection with automatic exchanges, during which he had occasion to make journeys abroad. Latterly he has been engaged on special investigations and administration work in the Manufacturing Department.

Mr. H. E. Humphries

Mr. R. L. Brown has been appointed chairman of Hopkinsons, Ltd., to succeed **Mr. Robert A. Hopkinson,** who has retired from the board.

Mr. P. V. Gurr, commercial manager of the Folkestone Electricity Supply Co., Ltd., has been appointed a Justice of the Peace for the borough.

Mr. E. Greenhalgh, A.M.I.E.E., assistant for outdoor machinery to the chief engineer of the Southern Railway, has retired and a presentation

was recently made to him by Mr. G. Ellson, chief engineer, on behalf of the staff of the department.

Mr. Greenhalgh joined the Great Northern Railway in 1898 as electrician in charge at Manchester and the following year he was transferred to the position of London outdoor assistant. In 1901 he was appointed power station engineer-in-charge, in 1905 assistant engineer (outdoor), and in 1907 chief assistant electrical engineer, joining the London, Brighton and South Coast Railway in 1909 as assistant to the chief electrical engineer. During the first two years of the last war he was engaged upon special work for the Admiralty and from 1916 to 1919 he was a lieutenant (electrical) in the R.N.V.R. Subsequently he was electric light and power engineer to the Brighton Railway before taking up, in 1923, the position from which he has just retired.

Councillor F. Humphrey (Battersea) has been elected a member of the London and Home Counties Joint Electricity Authority to fill the vacancy caused by the death of Councillor G. Fineran (Battersea).

Obituary

Mr. D. S. Cleaver.—We regret to learn that Mr. Donald Scott Cleaver, managing director of E.M.F. (Electrical), Ltd., Northampton, was killed on active service on October 29th.

Mr. T. Rigg.—The death has occurred of Mr. Thomas Rigg, of Kennedy, Stark & Co., electrical engineers, Paisley and Glasgow. He was an Ayrshire man and had been in Paisley for more than fifty years, starting in business about thirty-eight years ago.

Wills.—The late **Mr. D. W. R. Green,** chairman of Allen West & Co., Ltd., & Waygood-Otis, Ltd., left estate valued at £40,015.

Mr. C. O. Browne, a well-known television worker, who was killed in an accident, left £3,231.

Electricity in South Africa

(From a Correspondent)

PRELIMINARY returns of the sales of electricity by the Durban municipality for the year ended July 31, 1942, show the record figure of 236·7 million kWh, an increase of 6·5 per cent. over the previous year when the rate of advance was 5·7 per cent. This has been achieved in spite of the decrease in sales due to the black-out during the last six weeks of the municipal year. The total number of consumers rose from 40,593 to 41,982, an increase of 3·4 per cent.

Additional domestic electrical appliances installed included 1,137 stoves, 1,408 refrigerators, 443 water-heaters and 404 washing machines. Apart from refrigerators, these figures are less than those for the previous year, due in large measure to the restrictions on sales and the difficulty of obtaining supplies from overseas, a factor which is restricting sales of electrical appliances in all parts of South Africa. The total number of these appliances connected to the Durban supply mains at the end of July, 1942, was 21,936 stoves, 18,390 refrigerators, 11,418 water-heaters and 1,856 washing machines. Durban was one of the pioneers in South Africa in the hire-purchase scheme financed by the municipality.

Originally introduced only in Natal, daylight saving is now in force for the whole of the Union, and it is expected that this will make electric lamps last very much longer and thus save from 10 to 20 per cent. of the shipping space needed for their importation. It is estimated that about 1,500,000 fewer lamps will be used annually. Most of the South African power stations use coal and it has been calculated that annually they will save between 50,000 and 60,000 tons.

In its latest report the Electricity Supply Commission shows that the total output in 1941 was 4,254 million kWh, an increase of 4·52 per cent.; in 1940 the increase was 13·89 per cent. The largest advance was that of 26·14 per cent. (184·7 million kWh) in direct supplies for industrial purposes, but quantitatively mining again led with bulk supplies totalling 3,270·4 million kWh, an increase of 2·76 per cent. Direct sales for municipal use aggregated 312·3 million kWh, an increase of 10·35 per cent., and direct supplies for traction amounted to 417·7 million kWh, a 5·76 per cent. increase. Another 49·4 million kWh was sold in direct supplies for mining purposes, an increase of 6·24 per cent. Sales for domestic and street lighting totalled 19·5 million kWh, an increase of 16·21 per cent.

Restricting Development

The Commission has adopted a wartime policy of restricting load development as far as possible to essential purposes. During the year expenditure on capital account amounted to £1,073,202, which raised the total capital expenditure at the end of the year to £20,404,034. Capital expenditure on major works under construction and on major extensions will raise the total expenditure on capital account to about £24,250,000.

Total revenue was £3,008,674, with total production costs (including interest, redemption and reserve fund charges) at £3,004,520. The average revenue per kWh sold (including sundry revenue) was 0·1697d., with the average cost per kWh sold at 0·1695d.

During the past six years the average price per kWh sold by the Commission has been reduced from 0·266d. The total cost of the coal consumed, including carriage, was £831,652, with the carriage charge at £252,692, and the actual quantity of coal used was 3,397,836 tons of 2,000 lb.

The small surplus of £4,154 on all the Commission's operations during 1941 year, representing 0·14 per cent. of the total revenue, is a measure of the success achieved in carrying out the general principle laid down in the Electricity Act that the Commission shall, as far as practicable, operate its undertakings neither at a profit nor at a loss.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

I.M.E.A. Employment Agency?

I WAS amazed to read the advertisement for an electrical engineer and manager appearing in your current issue, which suggests that the I.M.E.A. is acting either as an employment bureau or a Post Office. " He who runs may read " and it is difficult to understand the reason for this procedure and form of advertisement, especially bearing in mind the recent announcements contained in the Personal section of your journal.

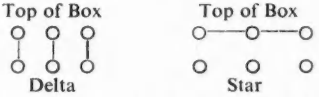
The purpose of this letter, however, is not so much to enter upon a discussion, as to intimate to the members of the Associated Municipal Electrical Engineers and of the Electrical Power Engineers' Association that, so far as can be ascertained from the technical data available, the salary offered in this advertisement is in accord with the agreement of the National Joint Committee of Employers and Chief Electrical Engineers. It is satisfactory to be able to make such a pronouncement in the present case. At the same time the prejudicial possibilities of this type of procedure will be apparent.

Equally obvious, in future cases, will be the difficulty of potential applicants who, before applying for posts, will naturally desire to be satisfied that the advertisers in question are meeting their statutory responsibility in respect of " recognised terms and conditions."

*London, S.W.*1. W. ARTHUR JONES,
Secretary,
Standing Joint Committee, A.M.E.E.-E.P.E.A.

Motor Terminal Connections

IS it not time that makers of AC motors in this country standardised their connection boxes? The Continental standard is as follows :—



English makers adopt various combinations including six side-by-side, three above each other each side, six in a circle, and some expect one to extract the star point or parallel points (in single-phase dual voltage jobs). This is all a bit hard on the unfortunate installer, especially when the machines have no diagrams. I have had case after case of star-delta motors wrongly connected to their starters when the blame has been thrown on the supplier of the motor—me !

Cannot, in these days of planning, the men of genius who pack 10-HP into a frame 10 in. in diameter at 1,440 RPM plan a simple *standard* star-delta terminal box?

WILLIE THE WHINER.

Electricity Supply Tariffs

THERE is no doubt of the advantages to be gained from simplification of electricity tariffs, particularly if this can be coupled with some measure of national uniformity. The chief difficulty in the way of extreme simplification is that prices must bear a close relationship to the cost of supply, otherwise an anomalous situation will again arise as exists under the normal domestic or " all-in " tariff, which is proving disadvantageous to some undertakings, for example, under cold-spell conditions.

The fundamentals of the costs of supply are generally accepted as a running cost component covering all those items which are dependent upon usage, such as fuel costs and transmission losses, and a standing charge component dependent upon the costs of being prepared to give the supply, including capital charges, service costs, management charges and power factor.

The first portion can be made a national uniform charge with but little difficulty for already a considerable step in this direction has been made by the Central Electricity Board's system of a standard charge with adjustment for fuel cost over considerable areas. There would appear to be little difficulty in the extension of this principle so that the cost to the consumer anywhere in Britain might, for example, be generation costs 0.2d. per kWh, plus a fuel adjustment of say 0.009d. per penny rise in the cost of fuel over 14s. per ton, plus 3 per cent. of the foregoing charges to allow for distribution losses and a further 5 per cent. for profit, etc., giving a total of about 0.46d. per kWh or 0.3d. per kWh on a pre-war basis. Such costs would greatly encourage electrical development.

The standing charge component is rather more difficult, but if tackled from a basic cost method will result in an equitable charge which provides the only basis upon which electricity supply can develop soundly. It need not, however, be the insoluble problem that it is often thought. It can be met as cheaply as, and much more soundly than, on some " guestimate " basis, such as floor area or rateable value, by the installation of a maximum-current meter, which if incorporated in the kWh meter need add but a few shillings to the metering cost.

The total standing charge for a given undertaking would be divided by the maximum demand registered. This figure should then be modified by a factor for installation load factor, and system diversity factor. These last two items will be somewhat arbitrary, but in general the greater the system diversity the lower will be the price per kW of maximum demand ; conversely, the higher the installation load factor the higher the charge made.

The power factor of the installation would also have to be taken into account. The service costs (excluded from the above) would consist of an annual charge as a percentage of the cost of the service cables, metering equipment and installation.

Merthyr Tydfil. D. A. PICKEN.

Electrical Laboratories

I WAS very interested to read the article by Mr. G. H. Rawcliffe on electrical laboratories for technical colleges in the *Electrical Review* of October 16th, and should like to express my agreement with almost the whole of what he says; in particular, his advocacy of the value of static apparatus is entirely on the right lines. Many college laboratories are much over-stocked with rotating machines, and their authorities do not seem to realise that non-rotary apparatus needs testing or even understanding by their students. Yet many of the most interesting and valuable tests are actually those made upon static apparatus which has the advantage of being less expensive and occupying less space than machinery. Finally, a much greater proportion of the students will, in their after career, be concerned rather with the design, manufacture and handling of this apparatus, than with dynamos and motors.

I would, however, like to stress the importance of other than thermionic apparatus, such as switches, control gear, protective gear, heavy conductors and the like. A suggested list of tests that should be highly suitable for a college or university laboratory is given below:—

1. *Fuses.*—Investigation of fusing characteristics, the effect of powder filling and oil immersion; short circuit tests.

2. *Protective gear.*—Determination of the characteristic curves of bias protection; characteristics of various overload relays, etc.

3. *Circuit-breakers.*—Tripping characteristics, contact heating, time of operation.

4. *Motor starting gear.*—Starting peaks and resistance grading.

5. *Networks.*—Mesh and star conversion—Kirchoff's Laws.

6. *Electro-magnets.*—Variation of pull with stroke and with exciting current; resistance of shading ring for AC magnets.

7. *Conductor heating.*—Skin and proximity effects; cooling due to various surfaces and surface coverings.

8. *Instrument transformers.*—(*a*) Current transformers.—Effect of burden upon the ratio. (*b*) Potential transformers.—Accuracy at various loads; other tests as for power transformers.

Witton, Birmingham. W. WILSON.

New Books

Standard Handbook for Electrical Engineers. By A. E. Knowlton. Seventh edition. Pp. 2303; illus. McGraw-Hill Publishing Co., Ltd., Aldwych House, Aldwych, London, W.C. Price 56s.

To meet the numerous shifts in the importance of the various branches of electrical art that have occurred during the eight years that have elapsed since the previous edition the subject matter has been regrouped, without, however, any basic departure from the familiar sequence. Much new matter has been introduced and among the most prominent changes is the expansion of the former section on power plant electrical equipment to embrace electrical equipment for the whole power system. Power transmission, electronics and radio, interior wiring, illumination, prime movers and telephones are other subjects with new treatments.

Recognition is given to such typically modern developments as air conditioning, electricity in aviation and in the petroleum industry, lightning technology, high-voltage generators and cyclotrons. The compilation of codes and standards has been greatly expanded so that the users may know where to obtain standard specifications and prescribed practices. The index has been enlarged and illustrations have been used even more profusely. Despite the considerably expanded scope of the subject covered, the new format and type adopted render the work more legible and more convenient to handle.—W.R.C.

Aircraft Radio. By D. Hay Surgeoner. Second edition. Pp. 154; plates 40. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 15s.

This new edition, which is a complete revision of the work, includes description of the latest types of direction-finding communications and beam approach equipment. The aircraft equipment section has been re-written to include some typical circuits and their operation, while the sections dealing with beam-approach systems and their operation have been expanded to give more detailed information of this important application of radio to aircraft.

Electrical Engineering Practice, Vol. 2. By J. W. Meares and R. E. Neale. Fifth edition, revised and enlarged. Pp. 668 ; figs. 244. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 35s.

In this new edition the opportunity has been taken completely to revise the text. Despite the saving of space effected by the omission of the greater part of the I.E.E. Regulations, the inclusion of additional concise notes on the scope and purport of the Regulations, together with other new material, has substantially increased the length of the work.

COMMERCE and INDUSTRY

Women in Engineering. Wage Claim Appeal.

Paper Salvage

ALTHOUGH very good results are being obtained from the electrical industry's campaign to gather in 5,000 tons of waste paper by the end of the year, a great effort is required during the next four weeks if the goal is to be reached. There is no need for us to stress the urgency and importance of waste-paper salvage or the particular responsibility of industry in this direction. We hope that all electrical firms and individuals will report progress (and difficulties) to the Electrical Industry Waste Paper Recovery Committee, 2, Savoy Hill, W.C.2.

Professional Scientists' Council

A Joint Council of Professional Scientists, representing over 10,000 qualified scientists, has been set up under the chairmanship of Sir Robert Pickard, F.R.S., by the Institutes of Chemistry and Physics, in association with representatives of other scientists. The Council has been established to voice the collective opinion of qualified scientists on matters of public interest, to provide a liaison between professional organisations of scientists for co-ordinated action in matters of common interest, and in particular to concern itself with the utilisation of scientists to the best advantage in the service of the community; the education, training, supply and employment of scientists; the better understanding of the place of scientists in the community; the maintenance of adequate qualifications and ethical standards; and the supply of information and advice to public and other bodies.

Among the members of the Council are Dr. J. J. Fox, C.B. (President, Institute of Chemistry), Prof. Sir Lawrence Bragg, O.B.E. (President, Institute of Physics), Prof. J. A. Crowther, and Mr. E. R. Davies.

Torch Battery Supplies

In the House of Commons last week Sir L. Lyle inquired whether the decision to terminate the manufacture of No. 8 torch batteries would be reversed, in view of the fact that these were largely used by women and the poorer classes.

The President of the Board of Trade (Mr. Dalton) replied that no decision had been taken to terminate the manufacture of these torch batteries. Owing to supply difficulties there would be fewer this winter than last, but they were still being made in very large quantities. Increased supplies would be available of batteries of larger size, which were considerably more economical in raw materials, labour and cost, relative to the number of hours light which they gave.

A.E.U. to Admit Women

The ballot vote of the members of the Amalgamated Engineering Union upon the question of the admission of women to membership has resulted in a majority in favour of the step. The Union's Rules Revision Committee has therefore unanimously decided that women shall be allowed to join the Union from January 1st.

The Committee has stressed the importance of this decision as marking a drastic change in the attitude hitherto adopted by operative engineers.

Women's Wages

The parties to the claim for higher wages for women employed in the engineering industry failed to agree at a meeting held last week, and the matter is to be reported to the Minister of Labour who will probably refer the matter to the National Arbitration Tribunal.

The Transport and General Workers' Union and the National Union of Municipal and General Workers maintained that women should receive at least 85 per cent. of the male labourers' rate, which would result in an average minimum of 55s. per week; that semi-skilled women should receive 90 per cent. of the male labourers' rate plus the amounts paid to men in semi-skilled work; and that women doing skilled work should receive the same rates as skilled men.

The National Federation of Engineering and Allied Employers proposed alternative rates for the three grades which provided that fully-skilled women should receive the full male rate. It was also proposed to institute "the rate for the job" system for women instead of relating their wages to those of the men.

Movements of Employees

New decisions by the Ministry of Labour and National Service are contained in the Building and Civil Engineering (Restriction on Transfer) (Exemption) Directions which come into force on December 7th. The Directions, which are made under the Building and Civil Engineering (Restriction on Transfer) Order, 1941, modify the present exemptions from the requirement that building and civil engineering employers may not transfer an employee from one site to another, or to another undertaking on the same site, without the permission of a national service officer.

Among other things it is provided that local authorities and public utility undertakings are exempt as respects all classes of employees, except those engaged in contract work for other persons. All employers are exempt as respects all their employees who are transferred (*a*) for not more than 28 days to urgent repair work necessitated by enemy action, or (*b*) for not more than 14 days for the sole purpose of doing repair work urgently necessary for the avoidance of danger to life or health or for the repair or restoration of essential public services.

Certain classes of contractors (including those engaged in electrical contracting, heating, ventilating and domestic engineering, or work for the production, distribution or maintenance of gas, water or electricity supplies) are exempt in respect of all employees actually engaged in these activities, whether transferred for employment or lent to other employers in similar

specialist activities. This applies to a branch, department or part of any undertaking mainly or wholly engaged in one of the specified activities.

Subject to other exemptions, plant hiring concerns must seek permission to transfer employees and this applies also to concerns having operatives employed on the installation, maintenance or repair of contractors' plant and appliances, or as drivers or attendants on contractors' plant.

No notice of termination of employment is required from either party where the employee is a manager, salesman, clerk (other than costing clerk, progress clerk or draughtsman) or in domestic service; where the employment is terminated with less than 48 hours' notice; or where the employer is scheduled under the Essential Work (Building and Civil Engineering) Order, 1942. It is noted that nothing in the Directions affects the operation of the last-named Order and that of the same title made in 1941, or the Undertakings (Restriction on Engagement) Order, 1941.

L.E.P. War Comforts Fund

Good work is being done by the War Comforts Fund organised by the staff of the Lancashire Power Co. During the past three years it has raised £1,766 and expended £1,651. The Fund looks after the welfare of 252 members of the staff now serving with the Forces, including six prisoners of war. Altogether 3,059 parcels had been sent up to October 9th last, as well as 1,006 postal orders (the latter being sent in lieu of rationed goods). Over 3,000 books and periodicals have been included in the parcels, among them we are gratified to learn being the *Electrical Review*.

L.A.C. R. Turner has written to the Committee :—" Please accept my warmest thanks for sending me the *Electrical Review*. There are several of my friends here who were in the electrical industry before the war and I pass the copies on to them. In addition, I have met the manager of the local power station and now he also receives the *Review*. They certainly travel round a good deal. I do not know who he passes them on to after he has finished with them."

The Chairman of the Committee is Mr. V. T. T. Atkinson, assistant accountant, and the members are Miss E. R. Hammond, Miss M. Beaumont and Messrs. J. Bone, E. Jones, J. Lee, J. C. Taylor, T. Heaton, T. Taylor and A. Hall.

Employee's Wage Claim

In the Court of Appeal last week Standard Telephones & Cables, Ltd., successfully appealed against the decision of a County Court Judge awarding an employee wages during a period of suspended employment.

The plaintiff was a nurse employed by the company whose services were terminated on a week's notice by permission of a national service officer, the company being scheduled under the Essential Work (General Provisions) Order, 1941. Later she appealed against this decision, her appeal was allowed and the national service officer's permission was cancelled. Her claim was for wages amounting to £10 16s. 8d. for the period from her dismissal to her reinstatement, and the County Court Judge awarded her that sum.

In giving judgment on the appeal, the Master of the Rolls said that the question was one of general importance but the answer was not in doubt. The plaintiff had endeavoured to extract from the word " cancel " (in connection with the national service officer's permission) a meaning which it could not bear, read in conjunction with its context. It was inconsistent with the wording of the Order to maintain that a contract of employment remained valid until either the time for appealing had expired or until the local appeal board had given its decision. Therefore the appeal would be allowed. Mr. Russell Vick, who appeared for the appellant company, said that his clients would not ask for costs in either Court.

Contract Price Adjustment Formulæ

The British Electrical and Allied Manufacturers' Association notifies us of the latest figures for use in its recently-agreed contract price adjustment formulæ:

(a) " Rates of Pay "—The rate of pay for adult male labour at November 14th shall be deemed to be 80s. 6d. ; (b) " Costs of Material " —The Index figure for Intermediate Products published by the Board of Trade on November 14th, is 171·1 and is the figure for the month of October, 1942

Jubilee Gifts to E.I.B.A.

The Electrical Industries Benevolent Association has received one hundred guineas from Rashleigh Phipps & Co., Ltd., in commemoration of the fiftieth anniversary of their foundation. This is the second gift of the kind which the E.I.B.A. has received this year, the first being from Ward & Goldstone, Ltd., a company which also goes back to 1892. This is a very happy and appropriate method of marking an electrical jubilee.

Banbury Fuel-Saving Exhibition

Many ingenious displays to illustrate ways of economising in fuel and what such saving means to the war effort were staged at an exhibition held last week at Banbury. The general plan was devised by the borough surveyor (Mr. S. Hilton) in co-operation with Mr. J. H. Davies, district manager of the S.W. & S. Electric Power Co., Ltd., the Banbury Gas Co. and local coal merchants. Meter-reading, cake and " fuel flash " competitions were arranged and electric and gas cooking demonstrations held. At the opening ceremony Mr. Moelwyn Hughes, Parliamentary Private Secretary to the Ministry of Fuel and Power, said that 'the response of householders to the Ministry's appeal was shown by the fact that in spite of the greater consumption by war industries the country as a whole was not using more coal.

Mica from Ceylon

The Colombo correspondent of *The Times* reports that Mr. Richard A. Hart, an expert of the British Ministry of Supply, accompanied by a Ceylon Government mineralogist, has just completed a 500-mile tour of the principal mica mines, to discuss with operators the possibility of increasing output and giving advice on improving quality and grading. Mr. Hart said that as a member of the joint mica mission now purchasing the whole output of merchantable

Indian mica for the requirements of the United Nations, he had gone to Ceylon with the approval of the United Kingdom and the Ceylon authorities to make arrangements for the purchase of the entire output of Ceylon mica.

He declared that some mines were producing mica equal to the best in the world. When local labour had been trained to trim and grade the mica, Ceylon should rank among the most important producing countries.

Public Lighting After the War

The Association of Public Lighting Engineers has sent a leaflet to lighting engineers throughout the country urging that preparations should be made now for post-war street lighting by maintaining equipment in good order. As it will probably be difficult to obtain materials immediately after the war, poles or pillars should not be scrapped even though they are not the type planned for the new installation. There is no demand yet for wholesale scrapping of pillars and protest should be made through the Association if any official request is received to this effect. In new peace-time plant ample provision should be made for an increase of light, not necessarily at once, but by stages,. Where possible men not called up should be kept in the same department or, at any rate, the same Corporation undertaking, so that they can be quickly transferred back to lighting.

Fluorescent Lighting Equipment

A data sheet produced by the Edison Swan Electric Co., Ltd. (L.E.1237) gives drawings and specifications of eight types of reflectors for 80-W fluorescent lamps for industrial lighting as well as illustrated notes on control gear, circuits and accessories and details of the "Portalux" unit. Copies are available from the company's Lighting Department, Ponders End, or branch offices.

Calendars

A recent Control of Paper Order prohibits, *inter alia*, the gratuitous distribution of calendars. Consequently, those firms who have provided their customers with calendars in past years can now only do so upon request and must make a charge for them. Generally, this charge will be a small one : in the case of British Insulated Cables, Ltd., who have reminded us of this point, it is only 3d. The Davenport Engineering Co., Ltd., is making a charge of 2d. for its 1943 calendar.

American Trade with Uruguay

According to *Foreign Commerce Weekly* (Washington) the United States electrical exporters expect to benefit by the new reciprocal trade agreement between their country and Uruguay. Under its terms there is a 30 per cent. reduction in the duty on American electrical plant for lighting and power, including wind-driven generator sets, storage batteries, electric fans and refrigerator parts, and a 23 per cent. reduction on complete refrigerators. The trade in storage batteries, which was formerly important, is reported to have declined owing to local assembly and manufacture. Most of the business in refrigerators and parts has always gone to the United States. In 1940 it was worth respectively £15,500 and £5,400. In the same year values of exports of radio equipment from the United States to Uruguay were as follows :—Complete sets £10,400 ; parts and accessories £17,000 ; and valves £4,000.

Bibliography of Alloys

An up-to-date bibliography of the literature relating to constitutional diagrams of alloys has been prepared by Dr. J. L. Haughton (National Physical Laboratory) and is obtainable for 3s. 6d., post free, from the Institute of Metals, 4, Grosvenor Gardens, London, S.W.1. Its 163 pages contain over 5,000 references to papers dealing with the binary, ternary and higher alloy systems, both ferrous and non-ferrous. References have been included, not only to contributions of a purely constitutional character, but also to many X-ray and physical-property studies that may have some bearing on the constitution of alloys. As a guide, the references, which in a few cases exceed 100, are marked with an asterisk where a new equilibrium diagram, or part of one, is to be found in the original. References are also included to the abstracts which the Institute has been publishing since its formation.

Trade Announcement

Associated Technical Manufacturers Ltd. announces that Mr. A. J. Evans, of 7, Astor Avenue, Romford, Essex (tel. : Romford 3485), is now responsible for the technical and sales representation of the company's electrical insulating materials, insulating sleevings and covered wires for London and environs.

Change of Address

The postal address of the British Cast Iron Research Association is now Alvechurch, Birmingham (telephone : Redditch 716).

TRADE MARK APPLICATIONS

RECENT applications for British trade marks include the following, objections against which may be entered within a month from November 18th :—

MAZDALUX. No. 620,353. Class 9. Electric induction and control apparatus for electric discharge lamps.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2. To be associated with No. 320,085 (1676), xiii and others.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding makers of the following :—

BRIMSDOWN contacts.

Hand coil winders with visual dial.

Call-up of Young Men

Commissioners' Memorandum

THE Electricity Commissioners have issued a memorandum to electricity undertakings with regard to the announcement, last month, of the Ministry of Labour and National Service that in view of the urgent need of young men for the Forces, the Government had decided that deferments granted for men in certain occupations who were under twenty-five (or thirty in other cases) at registration must be brought to an end (*Electrical Review*, October 30th.)

While it is appreciated that this may cause some difficulty, the Government is confident that at this stage of the war employers will do their utmost to ensure that young men will be set free for the Forces. As a preparatory step all the men affected will be summoned for medical examination almost immediately, but before any of them are called up, their employers will be given an opportunity of indicating for which men they need substitutes, and where it is agreed that a substitute is needed, the man concerned will not be called up until a substitute has been supplied. The Ministry of Labour and National Service particularly asks that employers should not enter into correspondence at this stage regarding individuals affected by this decision. The men concerned will be informed and their employers communicated with before calling up action is taken.

The list of occupations concerned covers most industries, but for the assistance of electricity undertakings the Commissioners have prepared a statement showing the occupations which affect the supply industry.

Under Twenty-five

The list of occupations in which deferment will not ordinarily be granted to men under twenty-five at the date of registration includes the following :—

Clerical and office staff : Planning clerk.

Draughtsmen.

Electrician, wireman, etc. : Overhead linesman ; cable layer, service layer (electricity) ; tester ; electrician's, overhead linesman's and wireman's mate or labourer ; and cable jointer's mate.

Electricity supply : Switchboard attendant and control room attendant.

Stationary engine, etc., driver-stoker : Telpher driver and stationary engine driver (electric)

Under Thirty

The list of occupations in which deferment will not ordinarily be granted to men under thirty at the date of registration includes the following :—

Bricklayer, building (general hand) ; carpenter and joiner (general hand) ; carpenter, fixer (building) ; mason (general hand) ; plumber (general hand) ; plumber's labourer, plumber's mate ; commercial goods vehicle (1½ to 2½ tons unladen weight) driver ; and hoist driver, oiler and cleaner (stationary engines, cranes, pumps, lifts, conveyors, etc.) but excluding greaser.

Clerical and office staff : Wages clerk ; progress clerk, progress chasers ; tally clerk, checkers, etc.

Local authority, whole time officer, England, Wales and Scotland : Any officer not specifically reserved at a lower age by reason of the occupation in which he is employed or specifically excluded from reservation.

Storekeeper : Foreman, stockkeeper, foreman storekeeper, head storekeeper. Stockkeeper, storekeeper (if employed full time on receipt, custody or issue of stock or stores).

Forthcoming Events

Institution of Electrical Engineers.—Thursday, December 3rd, 5.30 p.m. Paper : " Standardisation as applied to Industrial Electrical Instruments," by Lt.-Col. K. Edgcumbe, T.D.

Wireless Section.—Wednesday, December 2nd, 5.30 p.m. Paper : " The Electrical Amplifying Stethoscope and Phono-electrocardioscope," by Dr. G. E. Donovan.

Transmission Section.—Wednesday, December 9th, 5.30 p.m. Paper : " Some Problems in Transmission Line Design," by Mr. A. Burke (to be presented by Mr. J. J. O'Doherty).

Installations Section.—Thursday, December 10th, 5.30 p.m. Paper : " The Application of Electricity to Mine Pumping," by Messrs. G. B. Alvey and N. Tetlow.

Tees-side Sub-Centre.—Wednesday, December 2nd. Paper : " Fluorescent Lamps," by Messrs. L. J. Davies, H. R. Ruff and W. J. Scott.

North-Eastern Students' Section. — Friday, December 4th, 6.30 p.m. Neville Hall, Newcastle. Address by Mr. H. W. Green.

North-Western Centre.—Saturday, December 5th, 2.30 p.m. Engineers' Club, Manchester. Paper : " The Electric Spark in Air," by Dr. J. M. Meek.

South Midland Centre.—Monday, December 7th, 6 p.m. James Watt Memorial Institute, Birmingham. Paper : " Fluorescent Lamps," by Messrs. L. F. Davies, H. R. Ruff and W. J. Scott.

Northern Ireland Sub-Centre.—Tuesday, December 8th. Discussion on Mr. L. C. Grant's Paper " Electrical Industrial Installations," to be opened by Mr. F. W. Parkinson.

Electrodepositors' Technical Society.—Monday, November 30th, 4 p.m. Northampton Polytechnic, St. John Street, London, E.C.1. Discussion on " Acid Economy in Plating Processes."

Institution of Civil Engineers. — Tuesday, December 1st, 2 p.m. Great George Street, London, S.W.1. Paper : " Hydro-electric Development—Some Economic Aspects," by Messrs. J. K. Hunter and R. W. Mountain.

Association of Mining Electrical and Mechanical Engineers.—*South Wales Branch.*—Saturday, December 5th. " Brains Trust."

Institute of Welding.—Wednesday, December 2nd, 6 p.m. Institution of Mechanical Engineers Storey's Gate, S.W.1. Address by the president (Mr. R. Freeman), presentation to the retiring president (Sir William Larke, K.B.E.) and a brief review of electric welding applied to shipbuilding, by Sir Amos Ayre, O.B.E.

Association of Scientific Workers.—Saturday and Sunday, December 5th (2.30 p.m.) and 6th (11 a.m.). Gas Industry House, Grosvenor Place, London, S.W.1. Conference on " Scientists of the United Nations and the War Effort."

Electrical Imports of Iraq

United Kingdom Gains Germany's Share

RETURNS of the foreign trade of Iraq for 1940 have recently been issued. From them have been extracted the following figures showing the principal electrical imports and supplying countries, together with increases or decreases compared with 1939. (The dinar equals £1.) The total value was about the same in the two years, and the trade lost by Germany was for the most part gained by the United Kingdom, whose share in 1940 was 160,000 dinars out of a total of 226,000 dinars, the contribution of the United States being 38,000 dinars.

It will be seen that the chief increases were in telegraph and telephone cables and power plant from the United Kingdom, batteries and accumulators for motor vehicles from the United States and the United Kingdom, and lamps from Japan. There was a noteworthy decline in the imports of radio apparatus.

Benefit to the general trade of the country is expected from the operations of the Middle East board of the United Kingdom Commercial Corporation, whose function is to examine the import requirements of Iraq and the other countries of the Middle East and ascertain what surplus exports are likely to be available. In all the countries concerned there are discussions with regard to forming a post-war economic bloc with lower tariffs.

	1940 Dinars	Inc. or dec.
Dynamos, motors, convertors, transformers and choking coils for main distribution under Government approval—		
Total	15,100	+ 3,600
From United Kingdom	15,100	+ 11,500
„ Germany		− 5,700
Dynamos, etc. for other purposes—		
Total	8,600	− 3,700
From United Kingdom	6,500	− 1,200
„ United States	1,000	− 400
Batteries, accumulators and plates for motor vehicles and vessels—		
Total	9,200	+ 4,400
From United Kingdom	4,200	+ 2,300
„ United States	4,600	+ 2,400
Pocket lamp batteries—		
Total	1,800	*
From United States	320	
„ United Kingdom	890	
„ India	230	
„ China	210	
„ Japan	140	
Other accumulators and batteries—		
Total	4,500	− 1,600
From United Kingdom	3,300	+ 1,600
„ United States	1,100	− 400
Electro-mechanical and domestic equipment, not exceeding 15 kg.—		
Total	1,300	+ 600
From United Kingdom	710	+ 540
„ United States	410	+ 160
Heating units (resistances)—		
Total	300	− 480
From United Kingdom	200	− 400
Other, unspecified, electro-thermic apparatus—		
†Total	310	− 1,390
Filament lamps and tubes—		
Total	8,200	+ 1,000
From United Kingdom	4,600	+ 800
„ Japan	1,900	+ 700
Arc lamps	1,200	+ 960
From Japan	800	+ 800
„ United Kingdom	350	+ 170
Other lamps—		
†Total	400	− 350
Electro-medical apparatus—		
†Total	1,000	− 1,300
Radio valves—		
Total	1,900	+ 200
From United Kingdom	1,400	+ 300
„ United States	300	−
Radio receiving apparatus—		
Total	27,000	− 29,000
From United States	14,000	− 6,000
„ United Kingdom	6,500	+ 1,300
„ Holland	5,500	− 15,500
Other radio material—		
†Total	4,300	− 700
Telegraph and telephone apparatus—		
†Total	22,500	+ 4,500
Signalling apparatus—		
†Total	8,000	− 1,100
Transmission cables—		
†Total	1,500	− 2,800
Telegraph and telephone cables and wire for authorised public purposes—		
†Total	41,000	+ 40,880
Ditto for other purposes—		
Total	16,700	+ 1,000
From United Kingdom	12,500	+ 5,600
„ Belgium	2,600	− 800
„ Japan	1,300	+ 1,050
Insulators—		
Total	6,500	+ 2,900
From United Kingdom	3,800	+ 1,400
„ Belgium	1,500	+ 1,190
Switch and regulating apparatus for main distribution under Government approval—		
Total	2,400	− 4,600
From United Kingdom	1,900	− 1,900
„ Germany	500	− 2,100
Ignition apparatus (except for aircraft, vehicles and ships)—		
Total	400	− 6,200
Electric fans—		
Total	23,000	+ 1,000
From United States	13,500	+ 1,800
„ United Kingdom	4,800	+ 1,000
„ Italy	3,700	+ 2,400
„ Japan	970	+ 570
Other electrical appliances and accessories—		
Total	17,000	− 17,000
From United Kingdom	13,000	− 11,000
„ United States	2,100	− 600

* Comparative figures not available ; formerly included in next item.

† Mainly from U.K.

ELECTRICITY SUPPLY

Water Power and Economy. Swedish Progress.

Basingstoke.—MINIMUM CHARGE.—On the recommendation of the Electricity Committee it has been decided to make a minimum charge of 25s. per annum in cases where there has hitherto been a quarterly minimum charge of 7s. 6d.

METERS.—Application is being made to the Electricity Commissioners for permission to spend £100 from surplus revenue on the purchase of secondhand DC meters.

Fort William.—WATER POWER AND ECONOMY.—An interesting point arose during the discussion on the electrical engineer's report at a Town Council meeting recently. Councillor Kean said that the authorities had decided that with regard to the fuel target undertakings supplying hydro-electric energy were to be in the same position as those supplying thermally produced electricity. He added that this decision was felt to be defeating the object in view, as electricity could be used for many purposes in the burgh by private householders and others, thereby effecting a considerable saving in coal.

ELECTRICITY CHARGES.—Among a number of matters raised in a letter from the Lochaber Labour Party was a suggestion that charges should be reduced. With regard to this Councillor Kean said that the Council was as desirous of reducing charges as consumers were, and it would certainly be done as soon as the auditor had dealt with the accounts.

Hexham.—SUPPLY TO FARM.—The Rural District Council has approved plans for extending an overhead electric supply line from Wingrove to Milkwell Farm, Corbridge.

London.—PURCHASE OF DISUSED CABLES.—Amended proposals for the purchase by Stoke Newington Council of disused 11-kV cables from the Northmet Power Co. in connection with the provision of a standby supply to the Metropolitan Water Board include an alteration of the price from £450 to £427. The cables were damaged by enemy action, and a defective part is to be replaced and jointed by the Council, which is to submit a War Damage claim for the expenses involved. In the event of the expenses not being reimbursed by the Government the Northmet Co. is to contribute half the estimated cost.

PURCHASE OF CABLE DRUMS.—The chief electrical engineer and manager of the St. Pancras Electricity Department (Mr. R. Lee) has submitted a report on a proposal that the Council should buy a number of cable drums. As a result of contracts entered into before the war a stock of cable has been acquired at advantageous prices and not much of this has been used. Rentals varying from 8d. to 2s. 2d. a week are being paid for the hire of the drums and, furthermore, the cable companies have intimated their need of the drums and are pressing for their return. In reply to an inquiry Standard Telephones & Cables, Ltd., has intimated that it is prepared to sell the 29 drums of various sizes held by the Department for £590, an average of £20 7s. per drum, and would be willing to buy them back at an agreed price after the war. A quotation has also been obtained from Siemens Bros. & Co., Ltd., for the supply, subject to the Council obtaining the necessary licence and authorisation for the material from the Ministry of Supply, of twelve large new cable drums at a price of £19 10s. each. The Electricity & Public Lighting Committee feels that, quite apart from present circumstances, it is preferable that the Department should be equipped with a reasonable number of drums, and it has accordingly recommended that twelve should be bought from Siemens Bros. at the quoted price.

Overseas

Russia.—GERMANS SEIZE PLANT.—According to a special correspondent of the *Sunday Times* the Germans are seizing machinery and electric power plant in the Russian territory which they temporarily occupy. A new company, the Energiebau Ost, with a capital of 10,000,000 marks, has as its object the control of all power plant in the occupied eastern territories. It has already formed associated companies for the Ukraine and Caucasus. While the Caucasus company is not yet operating, the Ukrainian company has become the owner of all available power plant in its territory. Much of the machinery has been transferred to Germany for use in the armament industry.

Switzerland.—POWER PRODUCTION.—The official German news agency states that since the building of the Reckingen power station Switzerland now possesses plant with a possible yearly production of 8,300 million kWh, and after the starting up of further projected power stations the possible output will amount to 9,500 million kWh. Last year the country's power plant produced 5,500 million kWh, some of which was exported under international agreements. Nevertheless, in spite of increased production capacity, electric heating of houses has been banned this winter, according to a recent announcement by the Swiss radio.

Sweden.—RECORD OUTPUT LAST YEAR.—A message from *Reuter's Trade Service* (Stockholm) states that according to figures published by the *Kommerskollegium* the production of electric power in Sweden during 1941 reached the record figure of 9,113 million kWh, an increase of 5·7 per cent. on 1940. The whole of the increase was in hydraulic power, the figure for 1941 being 8,704 million kWh against 8,042 million kWh for 1940, while the output of thermal stations fell from 582 million kWh in 1940 to 409 million kWh last year. In no previous year had steam machinery played so small a part in the production of electric power as in 1941, which was of course due to the worsening of the situation for the different sorts of imported fuel.

With regard to consumption, 7,625 million kWh was used in Sweden, as follows (million kWh; 1940 figures in parentheses):—Motive power in big industries, 3,494 (3,600); electrochemical industry, etc., 1;347 (1,330); production

of heat in electric steam boilers, 405 (409); civil requirements, 1,412 (1,231); and railways and tramways, 867 (784).

RADIO & TELEPHONY

Abyssinia. — RE-ESTABLISHMENT OF TELEGRAPHIC SYSTEM.—The *Journal des Télécommunications* reports that the telegraphic system in Abyssinia has recently been re-established and put into operation. International radio-telegraphic communication *via* Khartoum is also now available with Addis Ababa, and five other large towns in the country.

Finland.—NEW RADIO STATION.—The Finnish Broadcasting Company is to establish a wireless station at Rovaniemi, in Northern Finland, according to an announcement on the Finnish Radio, states *Reuter*. It is expected that the station will begin transmitting next year.

France.—"RADIO CITY" FOR LYONS?—Plans for building a replica of Radio City, that famous New York skyscraper, at Lyons were referred to by a member of the Fine Arts Committee of Lyons in an interview. According to the Vichy Radio, quoted by *Reuter*, he said that the building was intended to contain a dozen studios for all kinds of broadcasts, a concert hall to seat 3,000 and a hall for chamber music. The project, if it were ever carried out, would make Lyons the main centre of French broadcasting.

Great Britain.—RADIO RELAY STATISTICS.—At June 30th last there were 398,985 subscribers to radio relay exchanges, an increase of 11,751 compared with March 31st, the number of exchanges being the same (278).

TRANSPORT

Dundee.—HALFPENNY FARES RESTRICTED.—The Corporation Transport Committee has decided to withdraw halfpenny fares except between midday and 2 p.m. from Monday to Friday.

Glasgow.—WOMEN TRAM DRIVERS.—As an experiment a number of conductresses are being trained with a view to becoming tram drivers. After several days of lectures and practice with the controls at the Corporation Transport Department's school, the girls, who volunteered for the training, will undertake route driving under the supervision of an instructor. There were 500 women drivers in Glasgow during the last war, when the trams were drawn up by hand-brake. Now the vehicles are fitted with air-brakes.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Madras Electric Supply Corporation, Ltd., states that in consequence of the extension of the war to the Far East, and of the resultant lighting restrictions, the scope of the company's activities has lessened and profits have declined.

The directors therefore are unable to declare an interim dividend on the ordinary shares. The question of a dividend on these shares will be considered when the results of the year's working to December 31st are available. For 1941 the interim dividend was 1½ per cent.

The Associated Equipment Co., Ltd., reports a net profit for the year to September 30th, subject to audit, of £141,500, as compared with £132,500 for the preceding year. It is proposed to maintain the final dividend at 5 per cent., again making 7½ per cent., tax free (equal to 15 per cent. gross) for the year.

Heenan & Froude, Ltd., report a trading balance of £56,514 for the year ended August 31st, a reduction of £14,688 as compared with the previous year, and a total profit of £57,780, a decrease of £16,122. The net profit is £48,718 (against £58,741). Provision for taxation requires £30,000, general reserve receives £5,000, and, as already announced, the final dividend is 5 per cent., plus a bonus of 5 per cent., again making 15 per cent., less tax, for the year. The balance carried forward is £8,630 (against £11,787 brought in).

The British Electric Resistance Co., Ltd., reports a profit of £30,306 for the year ended July 31st last, after debiting a loss of £5,630 on the British Power Transformer Co. This compares with £54,455 for 1940-41 when the Power Transformer Co. earned a profit of £4,485. After meeting taxation, etc., a dividend of 20 per cent. is again paid, leaving £5,241 to be carried forward (against £3,798). To finance increased production a bank loan was raised on the security of the floating assets. It is anticipated that the realisation of these assets will enable the loan to be repaid without loss. Although production increased, the employment of untrained labour and the working of long hours proved uneconomical.

Chadburn's (Ship) Telegraph Co., Ltd., has issued its accounts for the years to March 31st, 1941 and 1942 together. The gross profit for 1941-42 was £71,314, and after providing for tax the net profit was £7,216 (against £7,530). A first and final dividend of 6 per cent. is paid, plus a cash bonus of 4 per cent., again making 10 per cent., less tax. The balance carried forward is £14,693 (against £10,476 brought in).

Vactric, Ltd., reports a trading profit for the year to March 31st of £20,781. Two years' arrears paid on the preference shares bring payments up to date. The balance carried forward is £6,512 (against £125 brought in).

The Cape Electric Tramways, Ltd., earned a profit of £44,074 for the year ended June 30th last, against £34,146 in 1940-41. The replacements reserve again receives £10,000 and the dividend is raised from 5 to 6 per cent.

The Chloride Electrical Storage Co., Ltd., has announced an interim dividend of 5 per cent. on the "A" and "B" ordinary stock (unchanged).

The American Telephone & Telegraph Co. is paying the regular quarterly dividend of $2.25.

J. & F. Stone Lighting & Radio, Ltd., is maintaining its dividend at 5 per cent. for the year.

The Telephone Manufacturing Co., Ltd., is maintaining its interim dividend at 2½ per cent.

New Companies

Shannon Sales, Ltd.—Private company. Registered in Dublin, November 9th. Capital £1,000. Objects : To carry on the business of electricians, electrical engineers and contractors, mechanical engineers, suppliers of electricity for the purposes of light, heat, motive power or otherwise, etc. Directors : A. Mansour, 1, Orwell Gardens, Rathgar, Dublin ; A. A. Sevitt, 40, Rathdown Park, Terenure, Dublin, and M. Cowan, 24, Raymond Street, South Circular Road, Dublin.

Diploma Electrical Products, Ltd.—Private company. Registered November 10th. Capital, £100. Objects : To carry on the business of manufacturers of, and dealers in, batteries, accumulators and electrical appliances and accessories, motor engineers, radio manufacturers, etc. Directors : L. Klarfield and Mrs. R. Klarfield, both of 6, Moresby Road, E.5. Registered office : 1, Garrick Avenue, Golders Green, N.W.11.

Max-Arc Welders, Ltd.—Private company. Registered November 10th. Capital, £500. Objects : To carry on the business of manufacturers of, and dealers in, electric and other welders, welding plant and accessories, etc. P. S. Jackson, Over Costleys, Farnham, Surrey, is the first director. Registered office : 190, Thornton Road, Croydon, Surrey.

Companies' Returns

Statements of Capital

Electrical Wiring Investment Co., Ltd.—Capital, £5,000 in £1 shares. Return dated June 3rd (filed July 10th). All shares taken up. £5,000 paid. Mortgages and charges: Nil.

Hope's Heating & Lighting, Ltd.—Capital, £50,000 in £1 shares. Return dated July 21st. 27,000 shares taken up. £12,737 paid. £14,263 considered as paid. Mortgages and charges : Nil.

Henley's (South Africa) Telegraph Works Co., Ltd.—Capital, £2,000 in £1 shares. Return dated July 17th. All shares taken up. £2,000 paid. Mortgages and charges : Nil.

Cross & Cross, Ltd.—Capital, £20,000 in 20,000 shares of £1 each. Return dated July 15th, 19,775 shares taken up. £6,145 and £45 premium paid. £13,630 considered as paid. Mortgages and charges : Nil.

Beaconectric, Ltd.—Capital, £5,000 in 1,000 preference and 4,000 ordinary shares of £1 each. Return dated July 15th. 3,434 ordinary and 384 preference shares taken up. £1,350 paid on 1,100 ordinary and 250 preference shares. £2,468 considered as paid on the remainder. Mortgages and charges : Nil.

Electric & General Investment Co., Ltd.—Capital, £201,500 in £60,000 ordinary stock and 141,500 ordinary shares of £1 each. Return dated July 14th. £60,000 stock taken up. £22,000 paid £38,000 considered as paid. Mortgages and charges : £95,070.

Whitehall Electric Investments, Ltd.—Capital, £7,500,000 in £5,000,000 ordinary stock and £2,500,000 preference stock in units of £1. Return dated July 22nd, 1942. All stock taken up. £2,500,007 paid. £4,999,993 considered as paid. Mortgages and charges : Nil.

China & Japan Telephone & Electric Co., Ltd.—Capital, £200,000 in 200,000 shares of £1 each. Return dated July 20th. 150,000 shares taken up. £60,239 paid. £89,761 considered as paid. Mortgages and charges : Nil.

Exe Valley Electricity Co., Ltd.—Capital, £225,000 in £1 shares. Return dated July 24th. 215,000 shares taken up. £209,700 paid. £5,300 considered as paid. Mortgages and charges : Nil.

Boston & District Electric Supply Co., Ltd.—Capital, £210,000 in £1 shares. Return dated July 16th. 194,000 shares taken up. £194,000 paid. Mortgages and charges : Nil.

J. S. Ramsbottom & Co., Ltd.—Capital, £10,000 in £1 shares. Return dated July 22nd. All shares taken up. £1,000 paid. £9,000 considered as paid. Mortgages and charges : Nil.

Western Electric Co., Ltd.—Capital, £20,000 in 20,000 shares of £1 each. Return dated July 23rd. All shares taken up. £20,000 paid. Mortgages and charges : Nil.

Union Cable Co., Ltd.—Capital, £100,000 in £1 shares. Return dated July 23rd. All shares taken up. £100,000 paid. Mortgages and charges : Nil.

Mortgages and Charges

Electrical Utilities, Ltd.—Mortgage on 2, Rosedale Cottages, Rosedale Road, Richmond, Surrey, dated November 2nd, 1942, to secure £510 16s. 0d. Holders : United Dominions Trust, Ltd., Regis House, King William Street, E.C.4.

Euston Manufacturing Co., Ltd.—Particulars filed of £950 debentures authorised October 16th, 1942, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Pioneer Private Telephone Co., Ltd.—Satisfaction in full on October 26th, 1942, of mortgage registered October 28th, 1936.

Liquidations

Gollings & Ayres, Ltd.—Winding-up voluntarily. Liquidator, Mr. C. E. V. Salsbury, 7, St. Paul's Square, Bedford. This is a members' voluntary liquidation, and all creditors have been, or will be, paid in full.

Bankruptcies

D. G. Lee, electrician, 240B, Clapham Road, London, S.W.9.—Receiving order made November 12th on debtor's own petition. First meeting December 1st, and public examination December 18th, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

E. G. Williams, wireless and electrical dealer, 37, High Street, Brownhills, near Walsall.—Application for discharge to be heard on December 10th, at the Court House, Walsall.

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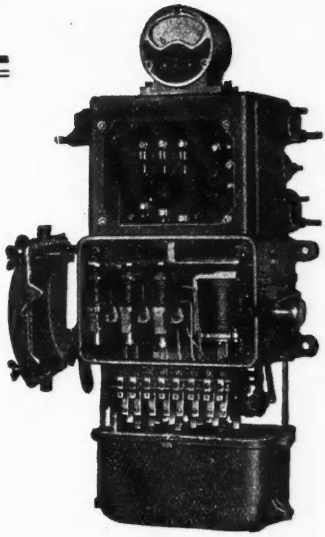

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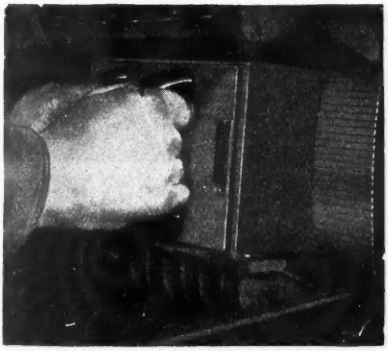

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STOCKS AND SHARES

TUESDAY EVENING.

THE volume of Stock Exchange business has fallen away considerably as compared with that of a fortnight ago. Prices were then run up somewhat exuberantly upon receipt of the news of the Anglo-American landing in North Africa and the rout of the enemy by the Eighth Army. Speculation took a hand in forcing up the prices of popular stocks and shares in which a free market exists; but, upon direct hints as to the possibility of Government intervention to check speculative activity, the animation died down, and prices relapsed, though to a very slight extent. The reaction hardly applied to shares in the best-class industrial undertakings; in nearly every case the rises recently secured by shares in the electrical and manufacturing groups have been well maintained. The disposition is for investment to wait upon the course of the news; and, pending further developments from the various war fronts, Stock Exchange business pursues a jog-trot pace.

"Speculation"

Action is being taken by the Stock Exchange Committee to review the present-day position as it relates to speculation that is considered undesirable in wartime. Reference was made here last week to the subject, and the Stock Exchange Committee has appointed a sub-committee to examine the whole subject with a view to seeing whether steps should be taken in order to render more effective the rules that relate to cash dealings. In normal times, as everyone knows, a Stock Exchange bargain is done for settlement on the succeeding pay-day, two of which occur every month, but under war conditions, dealings are officially fixed as being for cash, the idea being to put a stop to speculation of any kind. This cash dealings rule is carried out none too strictly; without doubt a good deal of speculation has been going on for some time past.

The attention of the Government has been called to it and the review of the subject by the Stock Exchange sub-committee will probably result in a tightening-up of the regulations which govern cash dealings.

The Transport Twins

The Stock Exchange Committee has given permission for dealings to take place in the 10s. ordinary and preference shares of the B.E.T. Omnibus Services and of Tillings Motor Services. These shares are the outcome of the Tilling & British Automobile Traction Company; it still remains in being, but there is not much market in its shares! The ordinary shares of the two companies, B.E.T. and Tillings Motor Services, are quoted at 30s. The 10 per cent. preference shares in each case stand at 24s. 6d. The yield on the preference at this price is £4 1s. 8d. per cent. which, if meagre, is about on a par with the return available from other shares of a similar class. As the shares in these two new undertakings are mostly in the hands of the parent company, the market is necessarily limited.

Market Matters

Vague rumours of the Buenos Aires Transport Corporation being nationalised by the Argentine Government had no effect upon Anglo-Argentine Tramways stocks. The 4 per cent. income is a point lower at 10½. British Electric Traction deferred remains in four figures but, at 1,005, is 10 down on the week. In the telephone and communication market, Cable & Wireless ordinary is 10s. up at 76½. Globe Telegraph ordinary keep their rise at 32s. Oriental Telephones are good at 57s. 6d. Great Northern Telegraphs at 20 reflect, by a rise of 10s., the hopefulness of buyers regarding post-war prospects. International "Tel. & Tel." rose to 7 and fell back to 6. A sixpenny reaction lowered Anglo-Portuguese Telephones to 23s. 6d. Shares in the telephone manufacturing catalogue continue to be in greater demand than supply.

Electricity Supply Shares

All of last week's rises in the shares of two dozen electricity supply companies have been retained, and new gains are marked in Bournemouth & Poole, London Associated, Scottish Power, North Eastern & Southern Areas. Advances of smaller amounts have lifted British Light & Power to 28s., London Electrics to 25s. 6d., Electrical Distribution of Yorkshire to 43s., and Yorkshire Electrics to 40s. 6d. The pressure persisted to buy Northmets, and the price responded with a rise to 39s. 6d., at which the yield is not more than £3 11s. per cent. on the money. Overseas shares are equally strong. Following last week's rally in Calcutta Electrics, Cawnpores have hardened to 27s. and Madras to 20s. 6d. Kalgoorlie at 9s. and Perak Hydro-Electrics at 11s. 6d. show gains of 1s. 6d. and 1s. respectively. Tokyo sixes hold their last week's rise of 4½ points to 21.

Madras Electric

The price of Madras Electric ordinary shares had risen to 21s. 6d., but on the announcement that the company has postponed payment of the interim dividend, came back to 20s. 6d. The company states that this is due to the extension of the war to the Far East, with resultant restriction upon the company's activities and profits. The question of a dividend on the ordinary

(*Continued on page* 701)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Nov. 24	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	56/–	+1/-	4 9 3
British Power and Light	6	6	28/-	+6d.	4 5 9
City of London	7	7	30/6	..	4 11 10
Clyde Valley	8	8	40/6	..	3 19 0
County of London	8	8	41/6	..	3 17 2
Edmundson's:					
7% Pref.	7	7	31/–	..	4 2 4
Ord.	6	6	28/–	..	4 5 9
Elec. Dis. Yorkshire	9	9	43/–	+6d.	4 3 9
Elec. Fin. and Securities	12½	12½	49/–	..	5 2 1
Elec. Supply Corporation	10	10	45/6	..	4 9 0
Isle of Thanet	2	Nil	14/–	+3d.	—
Lancs. Light and Power	7½	7½	35/6	+6d.	4 4 6
Llanelly Elec.	5½	5½	22/6	..	4 17 9
Lond. Assoc. Electric	4½	4	23/6	+1/6	3 8 0
London Electric	6	6	25/6	+6d.	4 16 0
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	40/–	..	4 0 0
Midland Counties	8	8	40/–	..	4 0 0
Mid. Elec. Power	9	9	42/6	..	4 4 9
Newcastle Elec.	7	7	30/–	..	4 13 5
North Eastern Elec. Ordinary	7	7	32/6	+1/6	4 6 4
7% Pref.	7	7	33/6	..	4 3 7
Northampton	10	10	47/–	..	4 5 0
Notting Hill 6% Pref. (£10)	6	Nil	8¼	..	—
Northmet Power:					
Ordinary	7	7	39/6	+9d.	3 11 0
6% Pref.	6	6	30/–	..	4 0 0
Richmond Elec.	6	6	25/–	..	—
Scottish Power	8	8	40/–	+5/-	4 0 0
Southern Areas	5	5	22/–	+1/-	4 11 0
South London	7	7	24/6	..	—
West Devon	5	5	22/6	..	4 9 0
West Glos.	4½	3½	20/6	..	3 8 4
Yorkshire Elec.	8	8	40/6	+6d.	3 19 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	5/6	..	—
Calcutta Elec.	7*	7*	31/6	..	—
Cawnpore Elec.	10	10	27/-xd	+⅛	7 8 2
East African Power	7	7	28/–	+6d.	5 0 0
Jerusalem Elec.	7	5	22/6	..	4 9 0
Kalgoorlie (10/–)	7½	5	9/–	+1/6	6 5 0
Madras Elec.	6*	4*	20/6	+1/–	—
Montreal Power	1½	1½	24	..	6 5 0
Palestine Elec. "A"	Nil	1*	33/–	+6d.	2 8 6
Perak Hydro-elec.	6	7	11/6	+1/–	—
Shawinigan Power	83cts.	90cts.	17	..	—
Tokyo Elec. 6%	6	6	21	..	—
Victoria Falls Power	15	15	78/9	..	3 16 2
Whitehall Inv. Pref.	5	5	19/–	..	5 5 3

Company	Dividend Previous	Dividend Last	Middle Price Nov. 24	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955–60	—	3	99	..	3 0 7
1955–75	5	5	114	..	4 7 9
1951–73	4½	4½	107½	..	4 3 9
1963–93	3½	3½	102	..	3 8 8
1974–94	3½	3½	99	..	3 5 4
London Elec. Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955-75	4½	4½	109	..	4 2 7
Lond. Pass. Trans.:					
A	4½	4½	118½	+1	3 16 0
B	5	5	117½	..	4 5 1
C	3	2⅞	55	..	5 4 8
West Midlands J.E.A. 1948–68	5	5	108	..	4 12 7
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	110½	+½	5 8 7
Def.	1½	1½	27	..	5 11 1
Anglo-Portuguese	8	8	23/6	–6d.	6 16 4
Cable & Wireless:					
5½ Pref.	5½	5½	107	..	5 2 10
Ord.	4	4	76½	+½	5 4 7
Canadian Marconi	$1	Nil	4cts.	6/3	.. 2 15 0
Globe Tel. & Tel.:					
Ord.	8½*	5*	32/–	..	3 2 6
Pref.	6	6	28/–	..	4 5 9
Great Northern Tel.:					
(£10)	Nil	Nil	20	+½	—
Inter. Tel. & Tel.	Nil	Nil	6	..	—
Marconi-Marine	7½	7½	31/6	..	4 15 3
Oriental Tel. Ord.	16	10	57/6	+1/6	3 9 5
Telephone Props.	6	Nil	13/6	..	—
Tele. Rentals (5/–)	10	10	10/–	..	5 0 0
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	4/–	..	—
4% Inc.	Nil	Nil	10½	–1	—
Brit. Elec. Traction:					
Def. Ord.	45	45	1005	–10	4 9 8
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	46/3	..	4 6 6
Brazil Traction	$½	$1	18½	..	—
Calcutta Trams	8	5½	19/–	..	5 15 9
Cape Elec. Trams	5	5	23/–	..	4 7 0
Lancs Transport	10	10	43/9	..	4 11 4
Mexican Light:					
1st Bonds	5	5	93½	..	5 7 0
Rio 5% Bonds	5	5	101½	..	4 18 6
Southern Rly.:					
5% Prefd.	5	5	75	..	6 13 4
5% Pref.	5	5	110	–½	4 11 0
T. Tilling	10	10	50/–	+6d.	4 0 0
West Riding	10	10	37/6	–6d.	5 6 8

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Nov. 24	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. ..	7½	10	32/–	..	6 5 0
Assoc. Elec.:					
Ord.	10	10	47/–	+6d.	4 5 0
Pref.	8	8	39/–	..	4 2 0
AutomaticTel.&El.	12½	12½	54/–	..	4 12 7
Babcock & Wilcox	11	11	47/9	+9d.	4 12 7
British Aluminium	10	10	50/–	..	4 0 0
British Insul. Ord.	20	20	100/–	..	4 0 0
British Thermostat (5/–)	18½	18½	15/9	−6d.	5 17 6
British Vac. Cleaner (5/–)	10	15	20/6	..	3 13 0
Brush Ord. (5/–) ..	Nil	6	6/6	..	4 12 4
Callender's ..	15	15	77/6	..	3 17 4
ChlorideElec.Storage	15	15	76/3	+¼	3 18 9
Cole, E. K. (5/–) ..	Nil	7	14/6	..	2 8 4
Consolidated Signal	17	17	85/–	..	4 0 0
Crabtree (10/–) ..	17½	17½	35/–	..	5 0 0
Crompton Parkinson Ord. (5/–) ..	30	20	24/–	..	4 3 4
E.M.I. (10/–) ..	Nil	6	17/9	..	2 7 7
Elec. Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	12½	12½	58/6	+6d.	4 5 7
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	46/–	+1/6	4 7 0
Ensign Lamps(5/–)	25	25	18/9	..	6 13 4
Ericsson Tel. (5/–)	22*	20*	42/–	+9d.	2 7 6
Ever Ready (5/–)	40	40	35/6	..	5 12 8
Falk Stadelmann	7½	7½	25/–	..	6 0 0
Ferranti Pref. ..	7	7	27/–	..	5 3 8
G.E.C.:					
Pref.	6½	6½	33/9	..	3 17 0
Ord.	20	17½	87/6	..	4 0 0
Greenwood & Batley	15	15	35/–	..	8 11 6
HallTelephone(10/–)	10	12½	21/9	..	5 15 0
Henley's (5/–) ..	20	20	23/9	..	4 4 2
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	15	55/–	..	5 9 0
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	32½	30	117/6	+½	5 2 0
Johnson & Phillips	15	15	64/6xd	..	4 12 4
Lancashire Dynamo	20	20	76/6	..	5 4 8
Laurence,Scott(5/–)	15	12½	10/–	..	6 5 0
London Elec. Wire	7½	7½	29/6	+6d.	5 1 8
Lucas, J.	15	15	73/3	−¼	4 2 0
Mather & Platt ..	10	10	45/–	..	4 9 0
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	97/6	−¼	4 2 0
Pye Deferred (5/–)	25	25	19/6	..	6 8 2
Revo (10/–) ..	20	17½	34/–	+6d.	5 3 0
Reyrolle	12½	12½	62/–	+9d.	4 0 7
Siemens Ord. ..	7½	7½	28/6	+6d.	5 5 2
Smith, S. (1/–) ..	50	37½	9/3	..	4 1 1
Strand Elec. (5/–)	4	7½	5/6	..	6 16 4
Switchgear & Cowans (5/–) ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M.. ..	10	10	45/–	..	4 9 0
Telephone Mfg.(5/–)	9	9	11/–	..	4 1 10
Thorn Elec. (5/–)	20	20	19/–	..	5 5 3
Tube Investments	23½	20	89/6xd	..	4 9 3
Vactric (5/–) ..	Nil	Nil	8/–	−3d.	—
Vickers (10/–) ..	10	10	18/6	+3d.	5 8 1
Ward & Goldstone (5/–)	20	20	20/6	+6d.	4 17 7
Westinghouse Brake	10	10	55/–	+1/–	3 12 9
Walsall Conduits(4/–)	55	55	42/6	..	5 3 6
West, Allen (5/–)	7½	7½	6/–	..	6 5 0

* Dividends are paid free of Income Tax.

Stocks & Shares (*Continued from page* 699)

shares will be considered when the results of the year's working to the end of next month, are available. This time last year, an interim dividend of 1½ per cent. free of tax was declared, which, with the 2½ per cent. final dividend, made 4 per cent. tax free for the whole twelvemonth. Postponement of the dividend may prove to be, of course, a precautionary measure.

Equipment and Manufacturing

The rises in this group are fewer in number and smaller in degree than those of a week ago, but the upward tendency is still marked. The substantial gains secured during the past fortnight have nearly all been held. The market is very firm, and there are not many shares obtainable. Chloride Electrical Storage are better at 76s. 3d. on the dividend announcement. Revo at 34s. are 6d. up. Reyrolles have risen to 62s., taking their place amongst the ordinary shares upon which the yield is a gilt-edged 4 per cent. International Combustion have gained a further half-crown, advancing to 117s. 6d. Ericssons advanced to two guineas, English Electrics to 46s. and Associated Electricals to 47s. Westinghouse Brakes at 55s. continue their improvement. London Electric Wire are better at 29s. 6d. Ward & Goldstone hardened to 20s. 6d. On the other hand, Lucas shares have gone back to 73s. 3d., and Murex to 97s. 6d. Vactrics recovered to 8s., after being 7s. 9d.

Industrials on Offer

In the market for electrical manufacturing companies' shares there are at the moment 5,000 Crompton Parkinson "A" ordinary offered at 24s. 6d. These are 5s. shares, and in each of the past three years, have received a dividend of 20 per cent. The yield at the present price is little more than 4 per cent.: dividends are due in June and December. English Electric ordinary at 46s. give the better yield of £4 6s. on the basis of the dividend of 10 per cent. paid annually for some years. Associated Electrical Industries £1 ordinary shares have been steadily bought by the provinces for the past two months; the price has risen to 47s., at which the return comes to 4¼ per cent.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1941

58. "Directional radio transmitters or radio beacons." Aga-Baltic Radio Aktiebolag. January 4th, 1940. (548900.)

1316. "Installation of electrical instruments on aircraft." W. W. Triggs (Lapco Soc. Anon.). January 31st, 1941. (548904.)

2717. "Signal transmission circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. February 29th, 1940. (548968.)

3950. "Adjustable lamp brackets and the like." C. L. Heyermans. March 24th, 1941. (548866.)

4271. "Automatic control of the electrodes of electric welding apparatus." F. W. B. Kittel (Linde Air Products Co.). March 29th, 1941. (548969.)

5286. "Electrical circuit arrangements incorporating grid-controlled gas-filled discharge tubes." Standard Telephones & Cables, Ltd., I. R. Worsley and C. T. Daly. April 24th, 1941. (548871.)

5294. "Preparation of methyl aryl silicones." British Thomson-Houston Co., Ltd. April 27th, 1940. (548911.)

5295. "Production of aroxy silicones." British Thomson-Houston Co., Ltd. April 27th, 1940. (548912.)

5299. "Portable electric tool motor construction." Black & Decker Manufacturing Co. February 18th, 1941. (548945.)

5320. "Tubulous boiler plant." Babcock & Wilcox, Ltd. July 27th, 1940. (548873.)

5321. "Methods and apparatus for heat-treating metallic tubular members." Budd Induction Heating Inc. May 17th, 1940. (548970.)

5329. "Electrical control systems involving mercury arc discharge devices for use more especially in connection with absorption of regenerated power." Electric Construction Co., Ltd., and J. C. Milne. April 25th, 1941. (548946.)

5357. "Attachment of metal fittings to insulators." Standard Telephones & Cables, Ltd., and E. C. Lee. April 25th, 1941. (548875.)

5457. "Electronic reactance devices." Sir L. Sterling. April 27th, 1940. (548948.)

5485. "Electrical heating apparatus." A. F. Berry. April 28th, 1941. (548972).

6351. "Ultra-high-frequency electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. May 16th, 1940. (548918.)

6901. "Air- or gas-blast electric circuit-breakers." C. H. Flurscheim, H. Holmes, A. B. Pearson and Metropolitan-Vickers Electrical Co., Ltd. May 29th, 1941. (548921.)

7021. "Electric stop motions of drawing frames." Howard & Bullough, Ltd., and E. J. Airey. June 3rd, 1941. (548923.)

7170. "Telephone systems." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). June 6th, 1941. (548838.)

7569. "Electric current collectors." British Insulated Cables, Ltd., London Passenger Transport Board, J. Holland and H. J. Powell. June 14th, 1941. (548925.)

7610. "Electrical acceleration and/or deceleration governing means." G. D. Smith, E. P. Hill and Metropolitan-Vickers Electrical Co., Ltd. June 16th, 1941. (548926.)

8084. "Electrical control systems for electric drives for winding material from one reel to another." British Thomson-Houston Co., Ltd. June 27th, 1940. (548895.)

8176. "Dynamo-electric machines." Mawdsley's, Ltd., C. W. H. Minchin and A. J. Parsons. June 28th, 1941. (548840.)

8540. "Fluorescent electric-discharge lamps." British Thomson-Houston Co., Ltd., and J. E. Stanworth. July 7th, 1941. (548978.)

8692. "Electrical resistance element." A.C.-Sphinx Sparking Plug Co., Ltd., and R. R. Barrington. July 10th, 1941. (Cognate application, 8693/41.) (548841.)

8739. "Methods of supplying power to thermionic amplifiers." British Thomson-Houston Co., Ltd. July 12th, 1940. (548842.)

9606. "Flash powders and method of preparing them." British Thomson-Houston Co., Ltd. August 2nd, 1940. (548963.)

9798. "Magnetic alloy of iron and aluminium." Standard Telephones & Cables, Ltd. August 7th, 1940. (548982.)

11072. "High-tension electric switches." D. R. Davies and Metropolitan-Vickers Electrical Co., Ltd. August 29th, 1941. (Addition to 523983.) (548989.)

11443. "Protective apparatus for electric circuits." British Thomson-Houston Co., Ltd. September 6th, 1940. (548931.)

11597. "Electric arc welded joints." J. A. Moss. September 10th, 1941. (548992.)

11701. "Telephone systems." Standard Telephones & Cables, Ltd. September 20th, 1940. (548932.)

12063. "Electrical transformers." Standard Telephones & Cables, Ltd. September 26th, 1940. (548848.)

14765. "Fluorescent materials and processes of making the same." British Thomson-Houston Co., Ltd. November 20th, 1940. (548997.)

14953. "Radioscopic and radiographic apparatus." Philips Lamps, Ltd., and S. W. West. November 20th, 1941. (548999.)

16671. "Systems of automatic control for synchronous frequency converters. British Thomson-Houston Co., Ltd. December 27th, 1940. (548852.)

1942

9786. "Portable electric tool motor construction." Black & Decker Manufacturing Co. February 18th, 1941. (Divided out of 548945.) (549000.)

Amended Specification

516409. "Automatic or semi-automatic telephone systems." J. E. Pollak.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Belfast. — December 2nd. Civil Defence Authority. Refrigerator and hotplate. Particulars from the city surveyor (Room 92), City Hall, Belfast, and tenders to C. A. Hayes, civil defence officer, 97, Lisburn Road, Belfast.

South Africa.—SALISBURY (S. RHODESIA).—December 7th. City Council. Coal-handling plant. (November 6th.)

Orders Placed

London. — Metropolitan Water Board. Accepted. Two 3-phase liquid rotor starters and speed regulators for plant at Orpington and Romney Marsh (£349).—Metropolitan-Vickers Electrical Co., Ltd. Lead-covered cable for these installations.—Callender's Cable & Construction Co., Ltd.

Salford.—Town Council. Accepted. 6,600-V switch unit at electricity works (£245).—General Electric Co., Ltd.

Stockport. — Town Council. Accepted. Electric vehicle batteries.—Tudor Accumulator Co., Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alfreton.—Works canteen; manager, South Normanton Colliery Co., Ltd.

Ancoats.—Works extensions; J. S. A. Young, architect, Moresby, Prestwich Park, South Prestwich, Manchester.

Barrow-in-Furness.—Electricity substation, for T.C.; F. L. Wooldridge, borough engineer, Town Hall.

Bromsgrove.—Reconstruction of offices and shops; J. B. Wilson & Sons, grocers, High Street and Alcester Road.

Houses; secretary, Newton Farm Estates, Bromsgrove.

Buildings for National Fire Service (£1,726); William Weaver, Ltd., builders, The Strand, Bromsgrove.

Cambridge.—Wartime nursery; C. H. Kemp, town clerk, Guildhall.

Chorlton-on-Medlock.—Workshop; C. H. Reynolds (Garden Showroom), Ltd., car dealers, 263, Oxford Road, Manchester, 13.

Conisborough.—Houses, for U.D.C.; H. Thirlwall, surveyor, Town Hall.

Corby.—Completion of Oakley Road houses for U.D.C.; D. W. Greaves, surveyor, The Jamb, Corby, Northants.

Dagenham.—Ambulance station (£1,000) and nurseries; borough engineer.

Darlington.—Wartime nurseries, Albert Hill Recreation Ground and South Park, and fire stations, Brooke Street and Barnard Street; borough engineer.

Annexe to office, Neasham Road, for John Tinsley, Ltd.; Bussey & Armstrong, builders, Brinkburn Street.

Derbyshire.—School canteen at Cavendish High School for Girls, Buxton, and buildings at Ilkeston for rescue and decontamination depot and report centre; J. Harrison, county architect, County Buildings, St. Mary's Gate, Derby.

Dunstable.—Works in connection with N.F.S. buildings, comprising extensions to existing premises; A. D. Harvey, town clerk, Municipal Offices.

Durham.—Wartime nurseries at Hetton, Blaydon and Thornley; county surveyor, 43, Old Elvet, Durham.

Essex.—Works in connection with youth centre, Leyton (£1,500, including equipment); J. Stuart, county architect, County Hall, Chelmsford.

Felling-on-Tyne.—British Restaurant at Pelaw; U.D.C. surveyor.

Gateshead.—Factory extensions; Hetherington & Wilson, County Chambers, Newcastle-on-Tyne.

Factory extensions, including offices and platers' shed; Couves & Partners, Carliol House, Newcastle-on-Tyne.

Hendon.—Additions to Addington House day nursery (£1,260), building at Clitterhouse Farm Depot (£775) and building at Hendon County School Depot (£1,466); borough engineer, Town Hall, N.W.4.

Hyde.—New Headquarters for Committee of the British Legion (J. R. Ramsden, hon. secretary); T. H. Higson, borough surveyor, Town Hall.

Jarrow-on-Tyne.—Air-raid shelters in the Simonside district; J. S. Weir, borough engineer, Town Hall.

Llangefni.—British Restaurant for U.D.C.; A. K. Jones, surveyor, Town Hall.

Manchester.—Works additions; W. Thorpe & Sons, Ltd., building contractors, Chester Road, Cornbrook.

Showrooms and offices, City Road, Hulme; Roberts, Wood & Elder, architects, 26, King Street, Manchester, 2.

Mexborough.—Extensions to Montagu Hospital; secretary.

Middlesex.—Nurseries at Trevor Crescent, Ruislip Gardens, Station Approach, South Ruislip, South Hillingdon and Hayes End areas, Drayton Gardens, West Drayton, and extensions at Hillingdon nursery; county architect.

Newhaven.—Rescue and first-aid depot; C. G. Mainwood, clerk, Council Offices.

North Riding.—Central kitchens at Kirby-moorside, Malton, Helmsley, Richmond, Guisborough, Northallerton, Pickering and Thirsk; J. R. White, county architect, County Hall, Northallerton.

Ormskirk.—Cooking depot at Burscough; E. J. Wright, surveyor, Council Offices, Burscough Street.

Plymouth.—Two central cooking depots, Beacon Park and Central Park; J. Paton Watson, city engineer, Guildhall.

Saddleworth.—Central cooking depot in Barn Meadow, Delph; surveyor, Council Offices, Uppermill, Saddleworth.

Stirling.—Dairy premises at Burghmuir; R. L. Ballantyne, Barnton Street.

Stockton-on-Tees.—Central kitchen at Ragworth (£2,600), and extensions to Bath Lane central kitchen; borough engineer.

Garage, Adam Street, for Athole G. Allen, Ltd.; own architects.

Additions; L. Brown & Sons, builders, Boathouse Lane, Stockton.

Swansea.—British Restaurant at the Capitol (£1,400); E. Morgan, borough architect.

Twickenham.—Extensions, Deacon Lodge, Strawberry Vale; J. B. Marr & Co., Ltd.

Garage and showroom, Heath Road; Spikins (Twickenham), Ltd.

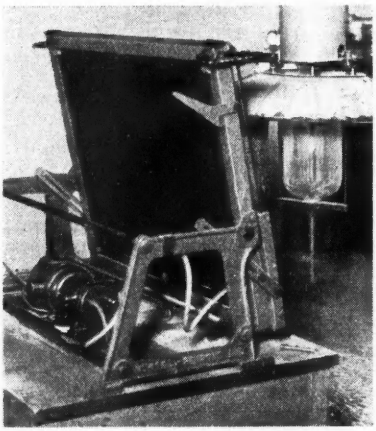
Walsall.—British Restaurant; M. E. Habershon, borough engineer, Council House.

Photo-Engraving Plant

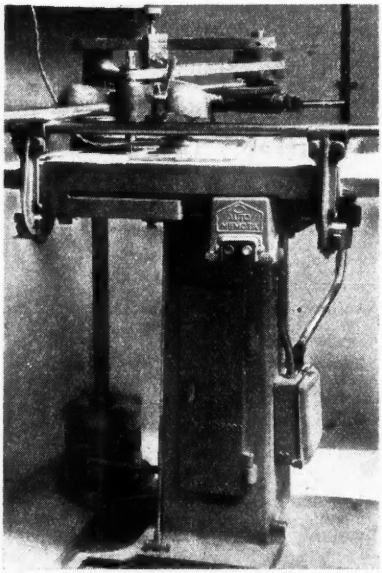
Electrically Operated Equipment

HAVING had the misfortune to have its premises and all its plant destroyed by fire, the Alpha Engraving Co., Ltd., has been able to equip its new works with the latest type of Hunter-Penrose equipment, most of which is electrically operated. For producing the negatives both open and closed arcs have been provided, the former being preferred for colour work. Except for colour work, wet collodion plates are normally employed. The arc lamps used for printing on to prepared copper (for half-tone blocks) or zinc (for line blocks) are of the closed type. To remove all air from between the glass negative and the metal while printing and so achieve perfect contact, a vacuum frame is employed incorporating a small suction pump driven by a 1/16-HP, 1,725-RPM motor.

The etching machines embody small electric motors driving paddle wheels which fling the solution of perchloride of iron on to the copper plates. When the etching has been completed the plates are finished off by means of bevelling



Enclosed arc and vacuum frame used for printing on to the sensitised metal plate



Routing machine driven through enclosed vertical spindle

and routing machines, which, like the circular saw and bowler used for making the wooden mounts, are operated by ½- or 1-HP motors. A ¼-HP motor drives a small combined grindstone and drill, the latter being used for countersinking the plates, preparatory to mounting them on wood.

COMSOL

Soft Silver Solder

Originally favoured for the soldering of armature end windings to commutator segments in electric motors, this silver/lead alloy has recently achieved widespread popularity as a substitute for solders of high tin content now in short supply.

Fuller details of Comsol, which melts at 296°C., are contained in pamphlet No. 121, a copy of which will be sent free on request.

JOHNSON, MATTHEY & CO. LIMITED

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Any length
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IMMEDIATE DELIVERIES
can be given in sizes up to ·072 in. diameter in any metal, and up to ·093 in. diameter in aluminium and in light alloys. . . . Write, wire, 'phone or call.
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Large

BRUSH

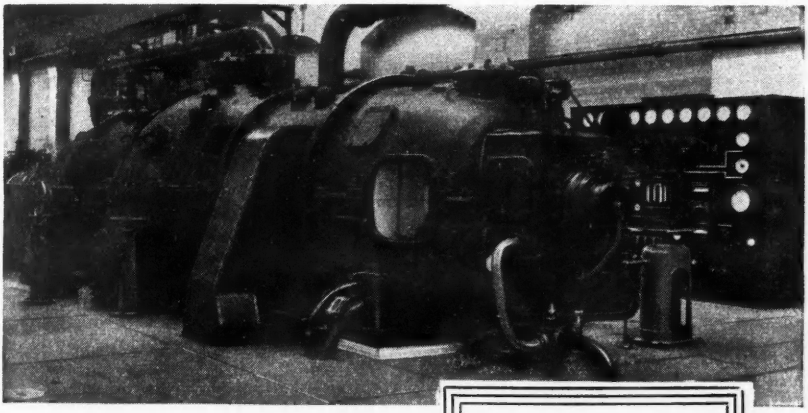
LJUNGSTRÖM

Turbo-Generator Sets

• QUICK Starting

• QUICK Re-Starting

GUARANTEED ! !



PEAK LOAD demands necessitate quick starting and, most important of all, speedy re-starting at all times, and for this service, the "BRUSH - LJUNGSTRÖM" Turbo-Generator is most outstanding.

THE BRUSH ELECTRICAL ENGINEERING CO. LTD. LOUGHBOROUGH ENGLAND

The REASON

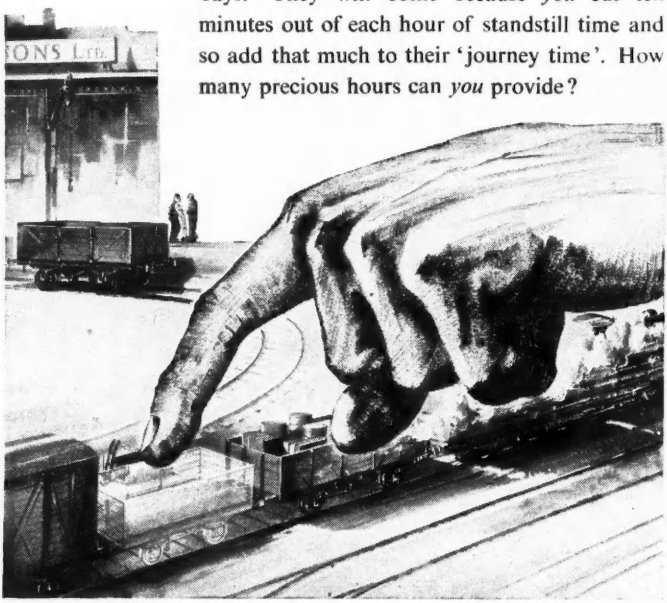
The Turbine has short shafts and the lightest mass of rotating parts with the most robust construction. These, together with the effective provision for expansion and contraction, enable the set to meet any condition of service.

5.75

They can't be in two places at once

EVERY single day from now on our railroads must carry thousands more wagonloads than they did last Winter. Thousands more each day!

Where will the wagons come from? They will come from private sidings, from private loading bays. They will come because *you* cut ten minutes out of each hour of standstill time and so add that much to their 'journey time'. How many precious hours can *you* provide?



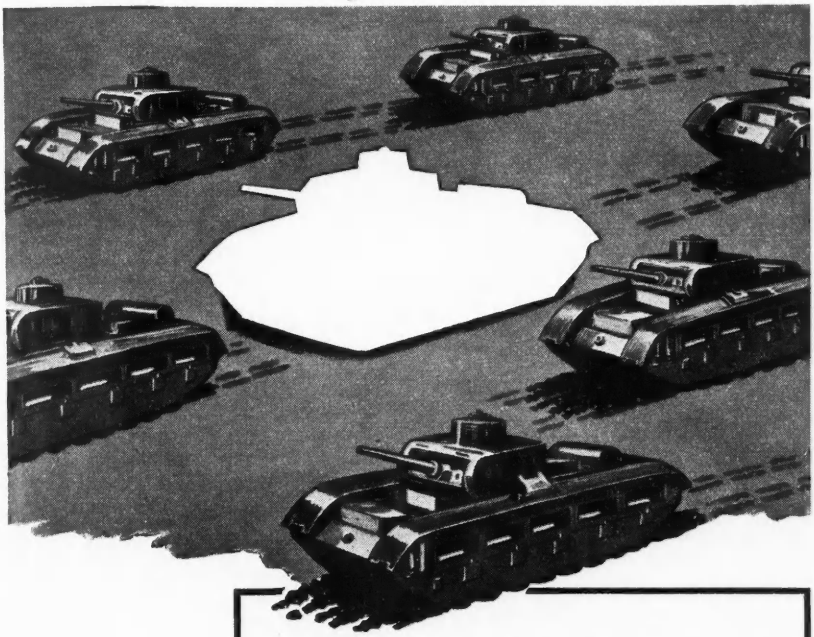
You know your own problems best. Tackle them in your own way But tackle them now. Plan, encourage ideas, improvise if needs be. Here's a starting-off agenda:

1. CLEARLY WRITTEN LABELS
2. LABOUR-SAVING EQUIPMENT
3. BLACK-OUT WORKING
4. OPINIONS OF "MEN WHO DO THE WORK"

WE MUST GET AN EVEN QUICKER TURNROUND

Ministry of War Transport

Was this missing tank 'Lost' *in your Works?*



Wasted Fuel can weaken our potential armed power more thoroughly than all the resources of the enemy. Is *your* works wasting fuel in 'indiscriminate' lighting? Is every unit of current consumed producing dividends of 'victory-production'? Investigate at once and if you are not satisfied, call in the Ekco Light Planning Service. Ekco Light Planning, with Ekco Lamps, can increase production *without increasing current consumption*. Write to Lamp Sales Dept., E. K. Cole, Ltd., Ekco Works, Southend-on-Sea.

EKCO

LIGHT PLANNING
***means* FUEL SAVING**

ENAMELLED-WIRE INSULATION

Is it Your Problem?

. . . then your answer is *HY-MEG (late "Swarc") New Process Insulation. . . . A development of first importance to Enamellers and Impregnators. . . . As much as halves stoving-time—*without new plant*. . . . Increases output up to 30%. . . . Gives more complete expulsion of air and moisture in cotton, silk and paper coverings. . . . Sets and remains hard under severest working conditions. . . . Is independent of raw materials in short supply.

*HY-MEG (Swarc) IMPREGNATING VARNISHES

V. 6738 The supreme impregnating varnish for withstanding severe mechanical stress. Suitable for 'heavy duty' units.

V. 6934 Made specially for enamelled wire windings. For 'super' results specify HY-MEG enamelling too!

ASK OUR 'BRAINS TRUST'— *for advice on insulation and elucidation of your tougher problems. We are equipped to serve you. Please send details.*

INSULATE WITH HY-MEG *Late* "SWARC" TO BE SURE

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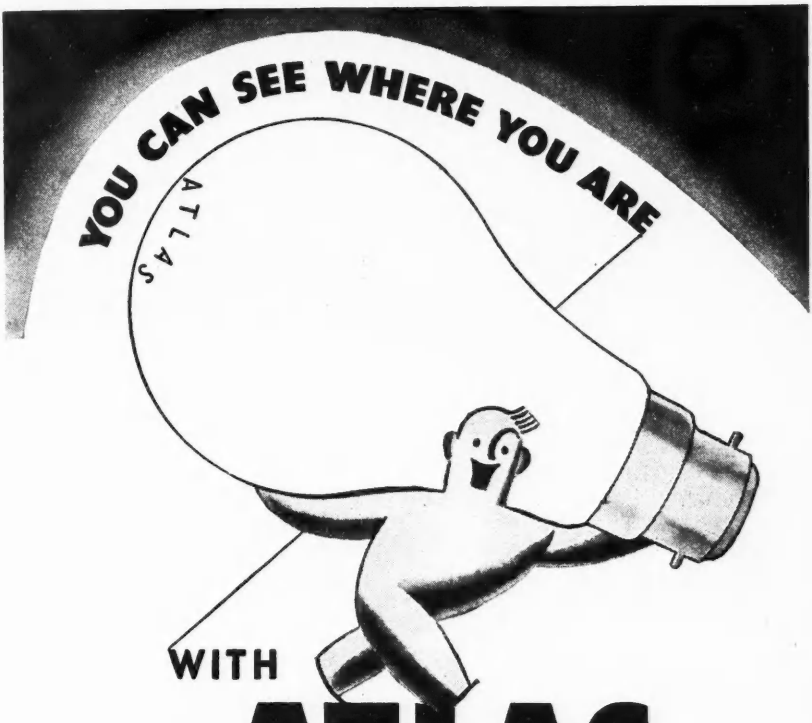
MANUFACTURERS OF INSULATING VARNISHES & ENAMELS



ATLAS LAMPS

You don't have to take chances because every Atlas Lamp goes through such rigid tests at the factory, just as exacting now as in peace time, that you can sell them with confidence. Very large users — who can and do keep accurate tests of lamp performance — buy more Atlas Lamps than any other single make. You make more profit by selling Atlas. Ask for our current terms.

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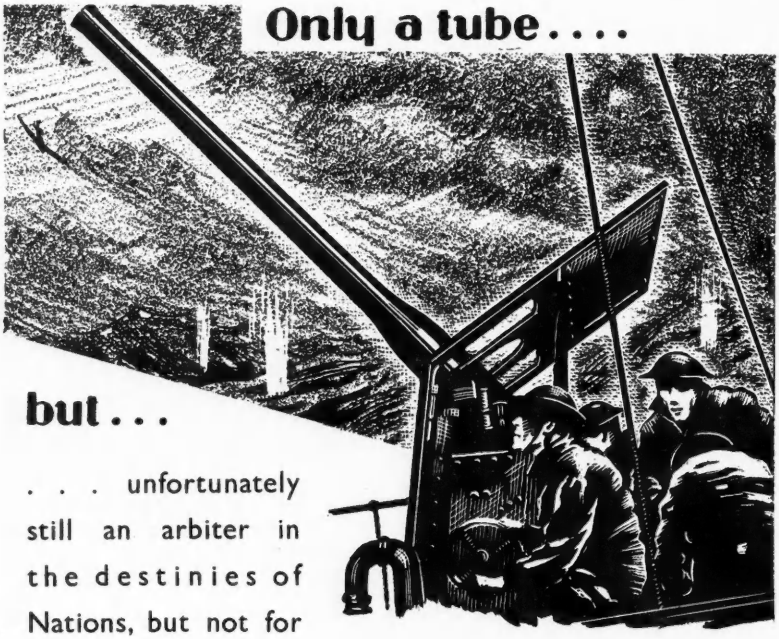
Telephone: Euston 1183 (7 lines) Telegrams: "Eleclampo, Kincross, London."

Northern Branch: 55 Blossom St., Manchester. 'Phone: Central 7461-2-3. 'Grams: "Eleclampo, Manchester."
North Eastern Depot: 46 Sandhill, Newcastle-on-Tyne 1. 'Phone: Newcastle 24068-9. 'Grams: "Macu, Newcastle-on-Tyne."
Scottish Depot: 200 St. Vincent Street, Glasgow. 'Phone: Central 4015 (*Pte. Branch Ex.*) 'Grams: "Calyou, Glasgow."

Only a tube....

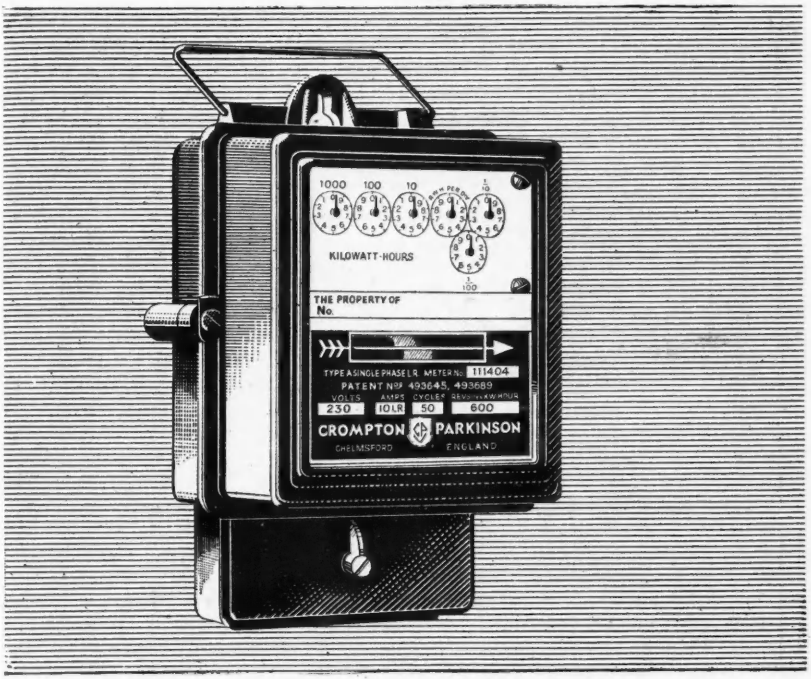


but...

. . . unfortunately still an arbiter in the destinies of Nations, but not for ever, as all men of Peace and Goodwill believe.

For they envision a new World of peace-time reconstruction, when the metal used in tubes of destruction may be more profitably used for constructive purposes —as such "Walsall" Conduit will be used in the future as in the past.

WALSALL CONDUITS LTD · WEST BROMWICH · STAFFS



ACCURACY MAINTAINED

The Crompton House Service Meter is a first line engineering job —a meter that is outstanding for low upkeep and for maintaining the accuracy requirements of B.S.S. 37/1937

CROMPTON PARKINSON
Limited

D

"Going, going -

YES but which — the stone or the rubber? If the rubber snaps again the stone will stay where it is and an older sportsman might reflect that the shortage of rubber extends to other and more needed things, and that much of the available supply is being used to support heavier ordnance on grimmer work. There is hardly an industry today which is not seeking an alternative to rubber.

In another field of 'Power Transmission,' that of the manufacture of insulated cable and wiring, the amount of rubber available has been drastically cut. The alternative high level busbar system is coming into its own because rubber for insulating has no place in it.

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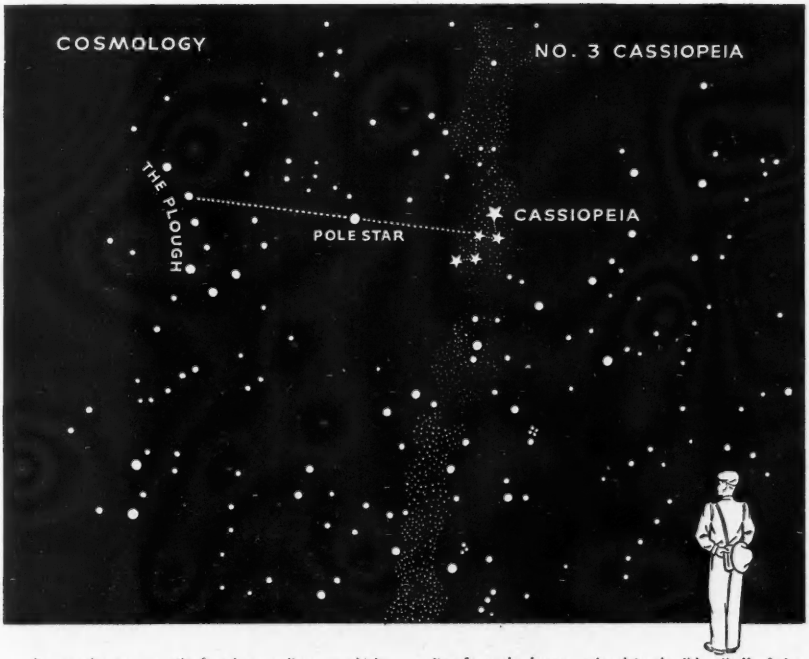

Among the more easily found constellations which revolve around the Pole Star in the northern sky, without ever passing below the horizon, is the group of stars known as "Cassiopeia," which is in the form of a letter W or M (according to which way up you look at it).

Cassiopeia is almost as conspicuous as our old friend the Plough (previously described) and lies about the same distance from the Pole Star but on the opposite side. Draw a line from the hump or bend in the "handle" of the Plough through the Pole Star and on to Cassiopeia, at the other end of this diameter. It therefore "balances" the Plough as they revolve about the central Pole Star.

Forming a background to Cassiopeia is part of that mysterious irregular whitish band consisting of millions of distant suns and known as the Galaxy or Milky Way.

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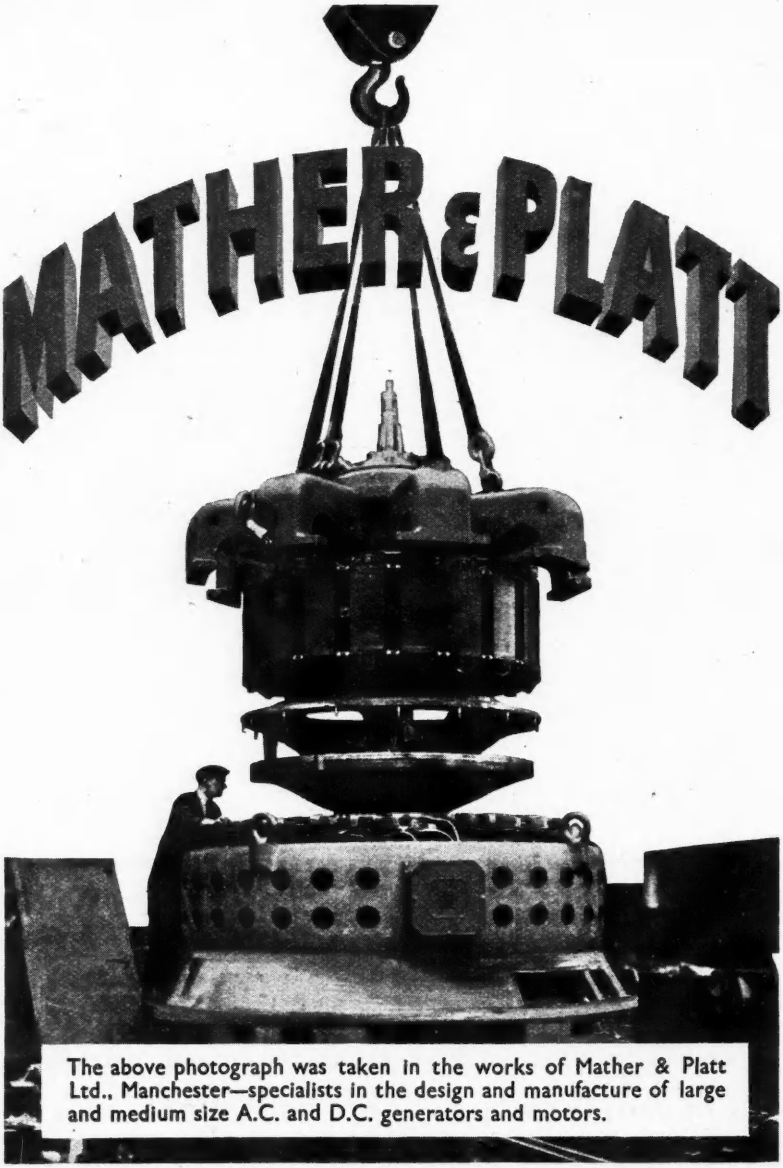

The above photograph was taken in the works of Mather & Platt Ltd., Manchester—specialists in the design and manufacture of large and medium size A.C. and D.C. generators and motors.

ENGLISH LIFE *No. 6*

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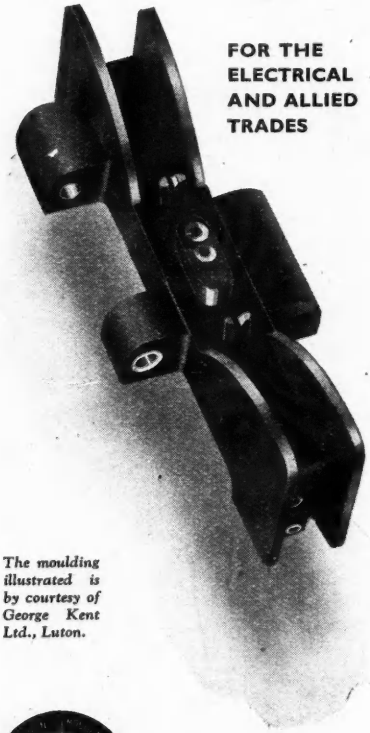

The moulding illustrated is by courtesy of George Kent Ltd., Luton.

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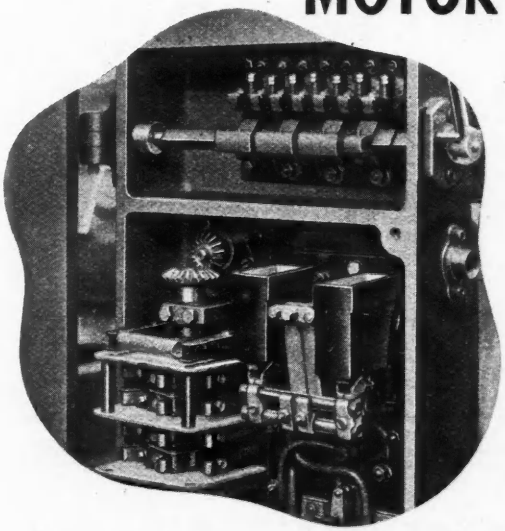
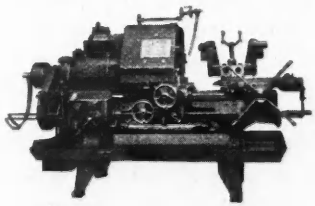
Extract from the MOTOR CONTROL *Booklet*



The illustrations show control gear for **HERBERT No. 4 S. E. CAPSTAN** comprising main contactor and thermal O.L's, isolator and butt-contact reversing switch. A faceplate 4-speed selector switch is mounted on the headstock. Mechanical and electrical interlocking prevent mal-operation.



*"The method of fitting control gear is largely dependent on the co-operation existing between machine tool and control gear makers.

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"There is a marked tendency towards the adoption of built-in equipment, mainly because it does away with cumbersome projections and awkward external cable runs and saves floor space. There are no special difficulties in providing equipment for building in; a cavity in the machine tool casting forms the enclosure for which an easily removable cover—often hinged—is fitted. The contactor gear can be assembled either in the cavity itself or on the back of the hinged cover. The control switches and push-buttons can be mounted on the front, but more usually they are arranged near the operator's working position."

**Short extract from descriptive pages of Motor Control booklet.*

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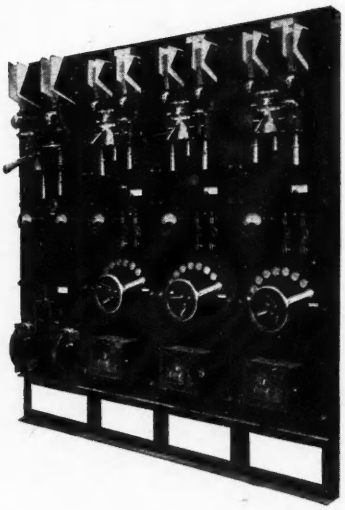

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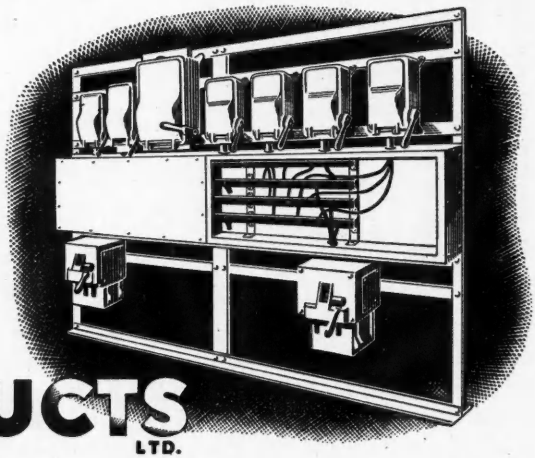

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